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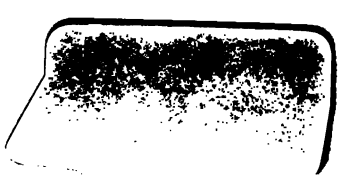
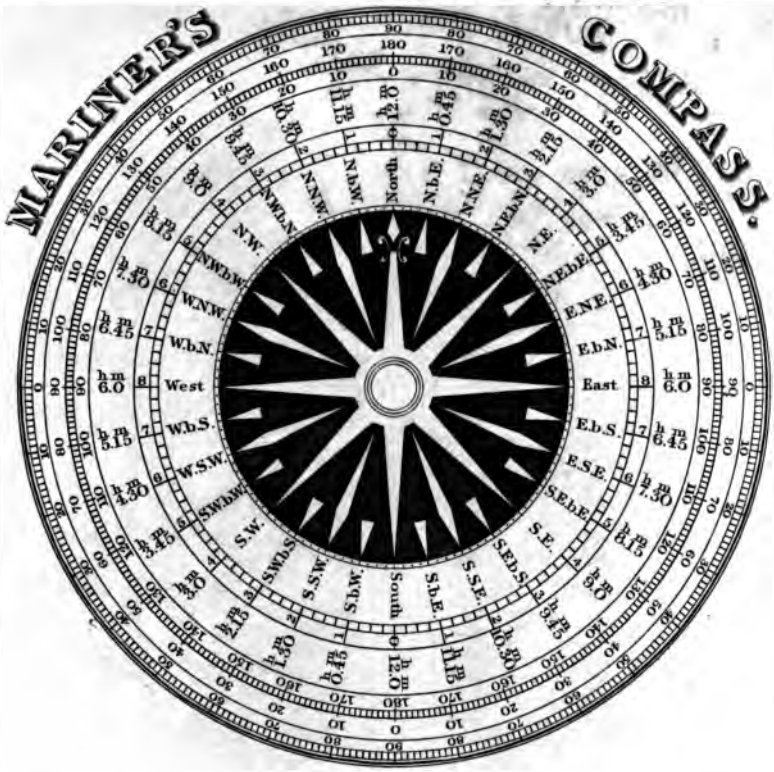
THE SEAMAN'S NEW DAILY ASSISTANT.





A TABLE OF THE ANGLES

which every Point & Quarter Point of the Compass makes with the Meridian.

NORTH		POINTS	° ′ ″	POINTS	SOUTH	
		0 – ¼	2 . 48 . 45	0 – ¼		
		0 – ½	5 . 37 . 30	0 – ½		
		0 – ¾	8 . 26 . 15	0 – ¾		
N.b.E.	N.b.W.	1	11 . 15 . 0	1	S.b.E.	S.b.W.
		1 – ¼	14 . 3 . 45	1 – ¼		
		1 – ½	16 . 52 . 30	1 – ½		
		1 – ¾	19 . 41 . 15	1 – ¾		
N.N.E.	N.N.W.	2	22 . 30 . 0	2	S.S.E.	S.S.W.
		2 – ¼	25 . 18 . 45	2 – ¼		
		2 – ½	28 . 7 . 30	2 – ½		
		2 – ¾	30 . 56 . 15	2 – ¾		
N.E.b.N.	N.W.b.N.	3	33 . 45 . 0	3	S.E.b.S.	S.W.b.S.
		3 – ¼	36 . 33 . 45	3 – ¼		
		3 – ½	39 . 22 . 30	3 – ½		
		3 – ¾	42 . 11 . 15	3 – ¾		
N.E.	N.W.	4	45 . 0 . 0	4	S.E.	S.W.
		4 – ¼	47 . 48 . 45	4 – ¼		
		4 – ½	50 . 37 . 30	4 – ½		
		4 – ¾	53 . 26 . 15	4 – ¾		
N.E.b.E.	N.W.b.W.	5	56 . 15 . 0	5	S.E.b.E.	S.W.b.W.
		5 – ¼	59 . 3 . 45	5 – ¼		
		5 – ½	61 . 52 . 30	5 – ½		
		5 – ¾	64 . 41 . 15	5 – ¾		
E.N.E.	W.N.W.	6	67 . 30 . 0	6	E.S.E.	W.S.W.
		6 – ¼	70 . 18 . 45	6 – ¼		
		6 – ½	73 . 7 . 30	6 – ½		
		6 – ¾	75 . 56 . 15	6 – ¾		
E.b.N.	W.b.N.	7	78 . 45 . 0	7	E.b.S.	W.b.S.
		7 – ¼	81 . 33 . 45	7 – ¼		
		7 – ½	84 . 22 . 30	7 – ½		
		7 – ¾	87 . 11 . 15	7 – ¾		
East.	West.	8	90 . 0 . 0	8	East.	West.

W. Norie delin.t

Romney & Son. Sc.

THE

SEAMAN'S

NEW DAILY ASSISTANT,

EXHIBITING AN EASY AND EXPEDITIOUS

METHOD OF KEEPING A SHIP'S RECKONING AT SEA;

CONTAINING

RULES FOR WORKING THE VARIOUS SAILINGS

BY THE

TABLES OF DIFFERENCE OF LATITUDE AND DEPARTURE,

AND FOR FINDING

The Latitude & Variation of the Compass by Observation;

ALSO,

GENERAL RULES FOR WORKING A DAY'S WORK, WITH THE METHOD OF CORRECTING THE COURSES FOR LEEWAY, VARIATION, &c.

THE WHOLE EXEMPLIFIED IN

A JOURNAL FROM ENGLAND TO MADEIRA.

TO WHICH ARE ADDED THE MOST NECESSARY AND

USEFUL TABLES;

PARTICULARLY A NEW AND ACCURATE

TABLE OF THE LATITUDES AND LONGITUDES

OF THE

Principal Points on the Coasts of Great Britain, Ireland, &c.

BY J. W. NORIE,

AUTHOR OF A COMPLETE EPITOME OF PRACTICAL NAVIGATION, LINEAR TABLES, &c. &c. &c.

TWENTY-FIRST EDITION.

London:

CHARLES WILSON, LATE J. W. NORIE & WILSON,

Publisher of Charts and Nautical Works,

AT THE NAVIGATION WAREHOUSE AND NAVAL ACADEMY,

No. 157, LEADENHALL STREET, E.C.

1878.

BIBLIOTHECA
MAR 1879
BODLEIANA.

127. c. 45.

ENTERED AT STATIONERS' HALL.

R. BARHAM, PRINTER, 1, QUEENHITHE, & 58, UPPER THAMES STREET, LONDON, E.C.

PREFACE.

THE design of the following pages is to assist young Seamen, who are deprived of the opportunity of entering on a regular course of Navigation, in acquiring, by their own application and industry, a short, easy, and plain method of keeping a ship's reckoning at Sea.

To this end I have selected, from my new Treatise on Navigation, such parts as are more immediately requisite to be understood in attaining the above object; as, the Method of solving the several cases in Plane, Middle Latitude, and Mercator's Sailing, by means of the Tables of Difference of Latitude and Departure; finding the time of High Water at any Place, essential in coasting, or entering a Harbour; determining the Latitude by Meridian Observations of the Sun or a Star; and the Variation of the Compass by Amplitudes. I have also explained the manner of keeping a regular Journal, and shewn how to correct the Courses steered by Compass for Leeway and Variation, and to allow for Currents, Lying-to, &c., with the Method of correcting the Dead Reckoning when the Latitude by Account and that by Observation disagree; and have exemplified the whole in a Journal from England to Madeira. The Tables likewise are placed in the most convenient order, and are, I trust, much more correct than those that have been usually introduced in works of a similar kind.

I would, however, by no means recommend to persons, who have leisure and opportunity, to be satisfied with having

obtained a knowledge of what is contained in this book only—but, on the contrary, to study diligently the several branches of Science on which the Art of Navigation depends, without which no one can become a skilful Navigator

J. W. NORIE.

In producing a *New* Edition of the Daily Assistant, care has been taken to bring up every subject to the standard of the present day; this has been done, not so much by omitting anything that was useful in the old edition, as by the introduction of new matter treating more at length on old subjects, and by bringing prominently forward those branches of Navigation which relate to the Tides and the Deviation of the Compass in Iron Ships. The Problems have also been altered and arranged for dates subsequent to 1877; and the New Tables will be found useful to Mariners for some years to come.

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Direction to the Binder.

The Mariner's Compass to face Title.

THE

SEAMAN'S

NEW DAILY ASSISTANT.

NAVIGATION.

NAVIGATION is the Art of conducting a ship through the wide and trackless ocean, from one port to another, with the greatest safety, and in the shortest time possible.

In order to perform this important business, the mariner must be able at all times to find the course and distance from one place to another; and to determine the place of the ship every day, what course she must steer, and how far she must run to gain the intended port.

The situation of any place is determined by its distance from two imaginary circles, called the equator and the first meridian.

The EQUATOR, by seamen called the *line*, is a great circle on the earth, equally distant from the Poles: it divides the earth into two equal parts, called HEMISPHERES; that having the North Pole in its centre is called the *Northern Hemisphere*, and the other the *Southern Hemisphere*.

MERIDIANS are imaginary circles on the earth passing, through both the Poles, crossing the equator at right angles, and dividing the globe into two parts, called the *Eastern* and *Western Hemispheres;* or rather, the meridian of a place is a semicircle passing through the place and terminating at the Poles, the remaining half being called the *opposite meridian;* hence every north and south line is part of a meridian.

It is usual for Geographers to fix upon a meridian passing through some remarkable place, and to call it the *first meridian;* thus, the British esteem that the first meridian which passes through the Royal Observatory at

80

Greenwich; so the French reckon for their first meridian, that which passes through the Royal Observatory at Paris; the Spaniards, that which passes through Cadiz, and some Geographers the meridian of Teneriffe; hence it appears the fixing of a first meridian is entirely arbitrary, most nations considering that the first meridian which passes through their capital, or principal observatory.

OF LATITUDE AND LONGITUDE.

The LATITUDE of a place is its distance from the equator, measured by an arch of a meridian contained between the equator and the given place: it is called either north or south, according as the given place is situated in the northern or southern hemisphere. Latitude is therefore reckoned from the equator towards the Poles, and never exceeds 90 degrees, that being the distance of the Poles from the equator. Hence a ship in north latitude sailing northerly, or in south latitude sailing southerly, increases her latitude; but in north latitude sailing southerly, or in south latitude sailing northerly, she decreases her latitude.

The PARALLEL OF LATITUDE of any place is a circle passing through that place parallel to the equator.

The DIFFERENCE OF LATITUDE between any two places is an arch of a meridian, contained between the parallels of latitude of those places.

The LONGITUDE of a place is an arch of the equator comprehended between the first meridian and that meridian which passes through the given place. It is usual to reckon longitude from the first meridian either east or west, according as the given place lies in the eastern or western hemisphere, until it meets at the opposite meridian: therefore, the longitude of a place cannot exceed 180 degrees, or a semicircle. A ship in east longitude sailing easterly, or in west longitude sailing westerly, increases her longitude; but in east longitude sailing westerly, or in west longitude sailing easterly, she decreases her longitude.

The DIFFERENCE OF LONGITUDE between two places is an arch of the equator intercepted between the meridians of those places, and cannot exceed 180 degrees.

To find the difference of Latitude between two Places.

RULE. When the latitudes are both of the same name, that is, both north or both south, subtract the less from the greater, and the remainder will be the difference of latitude; but when one is north and the other south, their sum will be the difference of latitude.

EXAMPLE I. What is the difference of latitude between the Lizard and Cape Finisterre?

Latitude of the Lizard ...	49°	58′	N.
Lat. of Cape Finisterre ...	42	56	N.
Diff. of latitude.....	7	2	
	60		
In miles	422		

EXAMPLE II. A ship from latitude 3° 10′ S. arrives to latitude 2° 26′ N.: required the difference of latitude made good.

Latitude left.....	3°	10′	S.
Latitude in	2	26	N.
Diff. of latitude	5	36	
	60		
In miles.....	336		

With the Latitude left and the difference of Latitude, to find the Latitude in.

RULE. When the latitude left and difference of latitude are of the same name, their sum gives the latitude in; but when they are of contrary names, their difference is the latitude in, of the same name with the greater.

EXAMPLE I. A ship from the West end of the Island of Madeira, in latitude 32°49′N., sails North 520 miles*: what latitude is she in?

Latitude of Madeira	32°	49′	N.
Diff. of latitude 520m. or	8	40	N.
Latitude in	41	29	N.

EXAMPLE II. A ship three days ago was in latitude 2° 48′ N., and has since then sailed South 426 miles: required her present latitude.

Latitude left.....	2°	48′	N.
Diff. of latitude 426m. or...	7	6	S.
Latitude in	4	18	S.

To find the difference of Longitude between two Places.

RULE. If the longitudes of the given places are both east or both west, subtract the less from the greater; but if one be east and the other west, add them together, and the sum or remainder will be the difference of longitude. When the sum of the two longitudes exceeds 180 degrees, subtract it from 360 degrees, and the remainder will be the difference of longitude.

EXAMPLE I. What is the difference of longitude between the Lizard and St. Mary's, one of the Western Islands?

Longitude of the Lizard	5°	11′	W.
Longitude of St. Mary's	25	14	W.
Diff. of longitude...	20	3	
	60		
In miles	1203		

EXAMPLE II. A ship sailing westward from North Cape, New Zealand, arrives to longitude 164° 47′ W.: required the diff. of longitude made good.

Long. of North Cape ...	173°	10′	E.
Long. of ship	164	47	W.
Sum	337	57	
	360	0	
Diff. of longitude...	22	3	
	60		
In miles	1323		

* When the difference of latitude or longitude is given in miles, it is to be divided by 60 to reduce it to degrees and minutes.

With the Longitude left and difference of Longitude, to find the Longitude in.

RULE. If the longitude left and difference of longitude be of contrary names, subtract the less from the greater, and the remainder will be the longitude in, of the same name with the greater; but if the longitude left and difference of longitude are of the same name, their sum will be the longitude in, of the same name with the longitude left; if this sum exceed 180° subtract it from 360°, and the remainder will be the longitude in, of a contrary name to the longitude left.

EXAMPLE I. Suppose a ship from St. Helena sails eastward till her difference of longitude is 220 miles: required her longitude in.

Long. of St. Helena	5°	45′	W.
Diff. of longitude 220m. or	3	40	E.
Longitude in	2	5	W.

EXAMPLE II. If a ship from longitude 176° 49′ W. sail westward till her difference of longitude is 10° 14′ W., what is her present longitude?

Longitude left	176°	49′	W.
Diff. of longitude	10	14	W.
Sum.....	187	3	
	360	0	
Longitude in	172	57	E.

The instruments used for estimating a ship's path or track at sea are the log, half-minute glass, and compass.

OF THE LOG AND HALF-MINUTE GLASS

The common LOG is a flat piece of wood in the form of a quadrant, with a sufficient quantity of lead fixed to the circular edge to keep it steady, and in a perpendicular position on the surface of the water. To this is fastened a line about 120 fathoms long, called the LOG LINE, which is divided into spaces called KNOTS, and wound on a reel, from which it runs off freely when used.

The HALF-MINUTE GLASS is of the same shape with an hour-glass and contains such a quantity of sand as will run through the hole in its neck in half a minute of time.

The length of the log-line between each knot ought to be 51 feet nearly, that being the same part of a nautical mile that half-a-minute is of an hour, *viz.* 120th part: but as the log is apt to be drawn after the vessel, and since it is safer to have the reckoning rather before than after the ship, 50 feet has been thought sufficient space between the knots, each of which contains 10 fathoms of 5 feet: indeed it is usual to allow only 48 feet to a knot, that is, 8 fathoms of 6 feet each, and sometimes a less quantity; with which a glass is used running 28 seconds: but whatever may be the assigned length of the intervals between the knots, it is most

convenient to divide them decimally, or into ten equal parts, by which the computation of the ship's run will be rendered more easy and accurate.

But both the log-line and half-minute glass are frequently affected by alterations in the heat or moisture of the weather; it therefore becomes necessary often to examine them, and if found erroneous, to correct the ship's run. The length of line between the knots may be easily ascertained by measuring them with a rule: and the half-minute glass may be examined either by a watch with a second hand, or if that be not at hand, by the following method—fasten a plummet to a line and hang this on a nail, observing that the distance between the nail and the middle of the plummet be $39\frac{1}{4}$ inches; then swing the plummet, and notice how often it passes under the nail while the glass is running out, and that will be the number of seconds measured by the glass.

To find the Length of a Knot corresponding to a Glass running any given Number of Seconds.

RULE. Add a cipher to the number of seconds run by the glass, and divide this by 6; the quotient will be the proportional length of a knot in feet.

EXAMPLE I. What ought to be the length of a knot when the glass runs 33 seconds?

6)330

55 feet.

EXAMPLE II. Required the length of a knot corresponding to a glass that runs 28 seconds.

6)280

46.67 or 46 feet 8 in.

OF THE MARINER'S COMPASS.

This instrument is an artificial representation of the horizon of any place. It consists of a circular card, divided into 32 equal parts, by lines drawn from the centre to the circumference, called RHUMB LINES, the extremities of which are termed POINTS or RHUMBS: the intervals are subdivided into halves and quarters, called HALF POINTS and QUARTER POINTS; the whole circumference is likewise divided into 360 degrees, consequently the angle comprehended between any two rhumbs is equal to 11 degrees 15 minutes. The four principal points are called the CARDINAL POINTS, two of which, opposite each other, are called the NORTH and SOUTH Points. that which is on the right hand, when we look towards the north, is termed the EAST, and its opposite the WEST Point; the names of the other points are compounded of these, according to their situation, but instead of the words, the initials only are inserted, as exhibited in the opposite Plate; where there is also a Table, containing the measure of the angles that each point, and quarter point makes with the north and south, or meridian line.

Under the card, along the north and south line, a small bar of steel is fixed, called the NEEDLE, which, being touched with a loadstone, acquires the peculiar property of pointing north and south, and consequently by the card determines the direction of the other points of the horizon. The needle, having a small socket in the centre, is supported, together with the card, on the point of a fine steel pin, on which it freely turns, and by the above-mentioned property its points keep always in the same direction: these are confined in a circular brass box with a glass cover, the box being hung in brass hoops or gimbals, in order to counteract the motion of the ship. The whole of these are placed in a square wooden box with a moveable lid which serves to support the gimbals, and secure the compass from accident in removals.

The compass is used to point out the direction that a ship sails at sea. For this purpose, it is to be so placed in the ship that the middle section of the wooden box, parallel to its sides, may be parallel to the middle section of the ship along its keel. When it is thus fixed, that point of the card which coincides with a perpendicular line, marked in the inside of the circular box, and termed by seamen, LUBBER'S POINT, will shew the direction of the ship's head.

The courses and distances which a ship sails in 24 hours are usually set down on a board, called the LOG BOARD, which will be further explained hereafter.

PLANE SAILING.

PLANE SAILING is the art of navigating a ship upon principles deduced from the supposition of the earth being an extended plane. On this supposition, the meridians are considered as being all parallel to each other, the parallels of latitude at right angles to the meridians, and the length of a degree on the meridian, equator, and parallels of latitude, every where equal. In this sailing there are four principal parts, *viz.* the Course Distance, Difference of Latitude, and Departure.

The COURSE is the angle which a ship's track or path makes with the meridian, and is expressed either in points or degrees. Thus, when a ship sails in a north-east direction, we say her course is 4 points, or 45 degrees.

The DISTANCE is the number of miles, &c. between any two places reckoned on the rhumb line of the course; or it is the length that a ship has sailed on a direct course in a given time.

The DIFFERENCE OF LATITUDE is the distance which a ship has made north or south of the place sailed from, and is reckoned on a meridian.

The DEPARTURE is the east or west distance a ship has made from the meridian of the place she departed from, and is reckoned on a parallel of latitude.

Hence it is evident that if a ship sail due north or south, she sails on a meridian, makes no departure, and her distance and difference of latitude are the same. If a ship sail due east or west, she runs on a parallel of latitude, makes no difference of latitude, and her departure and distance are the same: but when a ship sails in any other direction, she makes both difference of latitude and departure.

When a ship's course is 4 points, or 45 degrees, the difference of latitude and departure are equal; when the course is less than 4 points, or 45 degrees, the difference of latitude is greater than the departure; when the course is more than 4 points, or 45 degrees, the departure is greater than the difference of latitude.

When any two of the above parts are known, the remaining two may be found by several methods; but that which we shall here explain is performed by means of Tables I. and II., and is commonly called *Inspection.*

Table I. contains the difference of latitude and departure (in whole numbers and tenths), answering to distances not exceeding 300, and for courses to every quarter point of the compass. Table II. is of the same nature and extent, but for courses consisting of whole degrees. The courses are set down at the top of the pages, when they do not exceed 4 points or 45 degrees, and at the bottom, when they are greater than these quantities: the distances are regularly arranged in the columns marked *Dist.*, the first beginning at 1 and ending at 60, the second beginning at 61 and ending at 120, and so on to 300; corresponding to each of these distances, the difference of latitude and departure are set down in adjoining columns, marked *Lat.* and *Dep.*, and it must be carefully observed, that when the course is less than 4 points, or 45 degrees, these must be taken out, as marked at the top of the columns, but when they are more, as marked at the bottom of the pages.

Now as the difference of latitude and departure answering to any given course and distance, are found opposite the distance in that page of the Table which contains the course, if therefore any two of the four parts, *viz.* the course, distance, difference of latitude, and departure be given, and those two be found together in the Tables, the other two parts will be found in their respective places on the same page.

When any of the given parts (excepting the course, which is never to be multiplied or divided) exceed the limits of the Table, an aliquot part, as a half, third, fourth, tenth, &c. is to be taken, and those found corresponding are to be doubled, trebled, &c. that is, multiplied by the same figure that the given number is divided by.

CASE I.

The Course and Distance given, to find the difference of Latitude and Departure.

RULE. Find the course at the top or bottom of the Tables, and the distance in its column; opposite to which will be found the difference of latitude and departure in their respective columns.

EXAMPLE. A ship from latitude 48° 40 N'., sails N. E. by N. 296 miles: required her present latitude, and the departure made good.

Enter the first Traverse Table, and find the course 3 points at the top, and in one of the columns marked Dist. find the distance 296; then opposite to this, in the columns marked Lat. and Dep. will be the difference of latitude 246. 1, and the departure 164. 4.

To find the Latitude in.

Latitude left	48° 40′ N.
Diff. of latitude 246 miles, or	4 6 N.
Latitude in	52 46 N.

CASE II.

The Course and Difference of Latitude given, to find the Distance and Departure.

RULE. Find the course at the top or bottom of the Tables, and in that page, right against the difference of latitude, found in one of the lat columns, stands the distance and departure in their columns.

EXAMPLE. A ship sails S. E. ½ E. from St. Helena, in latitude 15° 55′ S until by observation she is in latitude 18° 49′ S.; required her distance run and departure made good.

Latitude of St. Helena.....	15° 55′ S.
Latitude come to	18 49 S.
Difference of latitude	2 54 = 174 miles.

Over the course 4½ points, find the difference of latitude 174 (or the nearest to it, which is 173.8), in a lat. column; opposite to which will be found the departure 211.8, and the distance 274, in their respective columns.

CASE III.

The Course and Departure given to find the Difference of Latitude and Distance.

RULE. Find the course among the points or degrees as before, and the departure in one of the dep. columns; against which will stand the distance and difference of latitude.

EXAMPLE. A ship from latitude 3° 16′ N., sails S. W. by W. ½ W., until she has made 356 miles of departure: required her present latitude and distance sailed.

In that page of Table I. marked with the course 5½ points at the bottom, find half the given departure, *viz.* 178 (the whole being too great) in the dep. column; opposite to which, in the lat. and dist. columns, will be 106.9 and 208; these being multiplied by 2 give the whole difference of latitude, 213.8, and the distance 416 miles.

To find the Latitude in.

Latitude left	3° 16′	N.
Diff. of latitude 214 miles, or	3 34	S.
Latitude in	0 18	S.

CASE IV.

The Distance and Difference of Latitude given, to find the Course and Departure.

RULE. Seek in the Tables, till against the distance, taken in its column, be found the difference of latitude in one of the following columns, adjoining to which will stand the departure; and if it be less than the difference of latitude, the course is to be taken from the top of the page, but if greater, the course will be at the bottom.

EXAMPLE. A ship from Cape St. Vincent, in latitude 37° 3′ N. sails between the north and west 430 miles, until her difference of latitude is 214 miles: required her course steered, and departure made good.

Seek in the several pages of Table II. until half the distance 215, and half the difference of latitude 107, are found opposite each other in their respective columns; against these will be found 186.2, which being doubled gives the whole departure 372.4; and as the column where the difference of latitude is found is marked lat. at bottom, the course is to be taken from thence, which in this example is 60 degrees.

CASE V.

The Distance and Departure given, to find the Course and Difference of Latitude.

RULE. Seek in the Tables till against the distance, taken in its column, be found the given departure in one of the following columns; and adjoining to it stands the difference of latitude, which if greater than the departure, the course is to be taken from the top of the page, but if less, from the bottom.

EXAMPLE. A ship from latitude 1° 32′ S. sails between the north and east 250 miles, and finds she has made 126 miles of departure: required the course steered, and her latitude in.

Seek in Table II. till opposite the distance 250, taken in its column, the nearest to the given departure 126 is found in its proper column, adjoining to which stands the difference of latitude 216.5; and as the column in which the departure is found is marked dep. at the top of the page, the course is to be taken from thence, which therefore will be 30 degrees.

Latitude left.....	1°	32′ S.
Diff. of Latitude 216 miles, or	3	36 N.
Latitude in	2	4 N.

CASE VI.

The Difference of Latitude and Departure given, to find the Course and Distance.

RULE. Seek in the Tables till the difference of latitude and departure are found together in their respective columns; opposite to which will be found the distance; and the course will stand at the top or bottom of the page, according as the difference of latitude is greater or less than the departure.

NOTE. In this case always seek for the larger of the two given numbers in one of the columns marked lat. at the top of the page, until the smaller is found opposite to it in the adjoining column, marked dep. at the top.

EXAMPLE. A ship from Funchal, in Madeira, in latitude 32° 37′ N., sails a direct course between the south and west until she is in latitude 31° 12′ N. by observation, having made 72 miles of departure: required her course steered and distance run.

Latitude of Funchal.....	32°	37′ N.
Latitude in by observation .	31	12 N.
Difference of latitude	1	25 = 85 miles.

Seek in the different pages of Table II. till the difference of latitude 85, and the departure 72, or the nearest thereto, are found together in their respective columns, which will be under the course 40 degrees; and the distance answering to these will be 111 miles.

TRAVERSE SAILING

WHEN a ship, either from contrary winds or other causes, is obliged to sail on different courses, the irregular or zig-zag track she makes is called a TRAVERSE, or COMPOUND COURSE; and the method of reducing these several courses and distances into a single course and distance, is called resolving a traverse.

To resolve a traverse, make a Table (as that in Example I.), and divide it into six columns; in the first of these set down the several courses, and opposite to them, in the second column, their corresponding distances; the third and fourth columns are to be marked N. S. at the top, and are to contain the differences of latitude; the fifth and sixth are to be marked E. W., to contain the departures.

Find the difference of latitude and departure corresponding to each course and distance, as in Case I. of Plane Sailing; set these down opposite the distance in their proper columns, observing that the difference of latitude must be placed in the north column, if the course be northerly, and in the south column, if the course be southerly; and that the departure must be placed in the east column, if the course be easterly, and in the west column, if it be westerly. When the course is due north, south, east, or west, set down the distance in that column answering to it. Add up the columns of northing, southing, easting, and westing, and set down the sum of each at the bottom; then the difference between the sums of the north and south columns will be the whole difference of latitude made good, of the same name with the greater; and the difference between the sums of the east and west columns is the whole departure made good, of the same name with the greater sum.

With this whole difference of latitude and departure made good, find the direct course and distance, as in Case VI. of Plane Sailing.

EXAMPLE I.

Suppose a ship from the Start, in latitude 50° 13′ N., sails W. S. W. 51 miles, W. by N. 35 miles, S. by E. 45 miles, S. W. by W. 55 miles, and S. S. E. 41 miles: required her direct course and distance sailed, and her latitude in.

The first course being W. S. W., look for 6 points in Table I., and opposite the distance 51 miles stands 19.5 or 19 miles and 5 tenths, for the difference of latitude, and 47.1, or 47 miles and 1 tenth, for the departure: now as the course is between the south and the west, the difference of latitude is to be set down in the S. column, and the departure in the W. column. In like manner proceed with each course and distance, and enter their corresponding differences of latitude and departures, as in the following table.

TRAVERSE TABLE.

Courses.	Dist.	Diff. of Lat.		Departure.	
		N.	S.	E.	W.
W. S. W.	51		19.5		47.1
W. b. N.	35	6.8			34.3
S. b. E.	45		44.1	8.8	
S.W.b.W.	55		30.6		45.7
S. S. E.	41		37.9	15.7	
		6.8	132.1	24.5	127.1
			6.8		24.5
	Diff. of Lat.		125.3	Dep.	102.6

To find the Latitude in.

Lat. left.....	50°	13′	N.
Diff. of lat. 125m. or	2	5	S.
Latitude in	48	8	N.

Seek in Table I. till the difference of latitude 125.3, and departure 102.6, are found opposite each other in their respective columns; the nearest to these will be 125.2 and 102.8, which give the course 3½ points at the top, and the distance 162 in its column.

Now it appears by the Traverse Table that the ship has sailed to the southward and westward; hence her course made good is S. 3½ points W., or S. W. by S. ½ W., and the distance 162 miles.

EXAMPLE II.

A ship from the North Foreland, in latitude 51° 23′ N., and bound to the Texel, which lies in latitude 53° 2′ N., and 115 miles to the eastward, sails N. E. 35 miles, E. by S. 25 miles, N. E. by E. ½ E. 40 miles, North 21 miles, N. W. by W. 30 miles: required her course and distance made good, the latitude she is in, and departure from the meridian; also the direct course and distance from the ship to the Texel.

TRAVERSE TABLE.

Courses.	Distance.	Diff. of Latitude.		Departure.	
		N.	S.	E.	W.
N. E.	35	24.7		24.7	
E. b. S.	25		4.9	24.5	
N. E. b. E. ½ E.	40	18.9		35.3	
North.	21	21.0			
N. W. b. W.	30	16.7			24.9
		81.3	4.9	84.5	24.9
		4.9		24.9	
		76.4	Diff. Lat.	59.6	Dep.

The difference of latitude 76.4 and departure 59.6 being looked for till they are found opposite each other in their respective columns, give the course 38°, and the distance 97 miles.

Hence the course made good is N. 38° E., or N. E. by N. ½ E. nearly (see the Table under the compass in the plate), and the distance 97 miles.

To find the direct Course and Distance from the Ship to the Texel.

Latitude of N. Foreland...	51°	23′ N.	Whole departure	115m.	E.
Diff. of lat. made good, 76m. or	1	16 N.	Departure made good	59. 6	E.
Latitude in.....	52	39 N.	Departure to make good ...	55. 4	E.
Latitude of Texel	53	2 N.			
Diff. of latitude to make good	0	23 N.			

The departure 55.4 and difference of latitude 23 being looked for in the Tables till they are found together, the nearest answering to them will be over the course 6 points, and opposite the distance 60 miles.

Now as the ship is to sail to the northward and eastward, her course to the Texel will be E. N. E., and her distance to run 60 miles.

PARALLEL SAILING.

IN Plane Sailing it was observed that the meridians are considered as being all parallel to each other, and the length of a degree on the meridian and parallels every where equal, which supposition will give just conclusions, so far as the course, distance, difference of latitude, and departure, are concerned, because a ship, when sailing on a rhumb, makes equal angles with the meridians: but as the earth is a sphere, or globe, and the meridians meet at the Poles, it is evident that the distance between any two meridians must vary in every latitude, their greatest distance being at the equator, on which the difference of longitude is measured; hence the difference of longitude always exceeds the departure, or meridian distance, (except on the equator, where they are the same) in proportion as the given places are situated further from the equator.

PARALLEL SAILING is the method of finding the distance between two places in the same latitude when their difference of longitude is known, or

of finding the difference of longitude answering to the distance or departure made good, when a ship sails due east or west.

This sailing is particularly useful in making small or low Islands, in which case it is usual to run into the latitude, and then steer due east or west.

In this sailing the complement of the latitude (found by subtracting the latitude from 90°) is to be taken in the Tables as if it were a course, the difference of longitude in a dist. column, and the departure, or meridional distance, in a dep. column.

CASE I.

The Difference of Longitude between two Places, both in one Parallel of Latitude given, to find their Distance.

RULE. Look for the complement of the given latitude as if it were a course, and for the difference of longitude in one of the dist. columns, opposite to which, in the corresponding departure column, will be the distance required.

EXAMPLE. A ship in latitude 36° 58′ N. and longitude 20° 25′ W. is bound to St. Mary's, one of the Western Islands, in the same latitude, and in longitude 25° 13′ W., what distance must she run to arrive at the Island?

	90° 0′	Longitude of ship.....	20° 25′ W.
Latitude.....	36 58	Longitude of St. Mary's.	25 13 W.
Co. latitude...	53 2	Diff. of longitude	4 48=288 miles.

Seek for the complement of the latitude 53° among the degrees in Table II. as if it were a course, and for the difference of longitude 288 in one of the distance columns of that page, opposite to which, in the departure column, will be found 230, the departure or distance required.

CASE II.

The Distance between two Places both in the same Parallel of Latitude given, to find the Difference of Longitude.

RULE. Look for the complement of the latitude as a course, and for the dist. in one of the dep. columns, opposite to which will be found the difference of longitude in the corresponding dist. column.

EXAMPLE. A ship from latitude 49° 32′ N. and longitude 10° 16′ W. sails due west 118 miles: required her present longitude.

Look for the co. latitude 40° in the Table, as a course, and for the distance 118 in one of the departure columns, opposite to which, in the distance

column, will be found 184; but as the co. latitude is nearly half-way between 40° and 41°, look again in the page with 41° at the top, for the distance 118 in one of the departure columns, and opposite in the distance column will be found 180; then half the sum of this and 184, found before will be 182, the difference of longitude.

To find the Longitude in.

Longitude left.....	10°	16′	W.
Diff. of long. 182 miles, or...	3	2	W.
Longitude in	13	18	W.

MIDDLE LATITUDE SAILING.

WHEN a ship sails due north or south, she keeps on the same meridian, and therefore does not change her longitude, and her distance run is the difference of latitude; consequently her place is easily determined by the latitude left, and difference of latitude. Again, when a ship sails due east or west, her difference of longitude is found by the latitude in, and departure or meridian distance, as already explained in Parallel Sailing; but when she sails upon any other course, she changes both her latitude and longitude. Now the difference of longitude cannot be inferred either from the departure, considered as a meridian distance in the latitude left, or that come to, for in the greater latitude it would give the difference of longitude too much, and in the lesser latitude too little; the departure is therefore accounted a meridian distance in the mean of the two latitudes, and then the difference of longitude is found as in Parallel Sailing; hence this method, which is compounded of Plane and Parallel Sailing, is called MIDDLE LATITUDE SAILING.

The middle latitude is half the sum of the two latitudes when they are of the same name; or half their difference if of contrary names.

This method of sailing, although not strictly accurate, especially in high latitudes, approaches sufficiently near the truth for a day's run; but it is used principally in low latitudes, and when the ship makes a course nearly east or west.

CASE I.

The Latitudes and Longitudes of two Places given, to find the Course and Distance between them.

RULE. Find the complement of the middle latitude among the degrees in Table II. as if it were a course in Plane Sailing, and look for the difference of longitude in one of the distance columns; opposite which, in the corresponding departure column, will be the departure. With the departure thus found, and the difference of latitude, find the course and distance, as in Case VI. of Plane Sailing.

EXAMPLE. Required the course and distance from Cape St. Vincent, in latitude 37° 3′ N. and longitude 9° 1′ W., to Funchal, in Madeira, in latitude 32° 38′ N. and longitude 16° 56′ W.

Lat. Cape St. Vincent	37° 3′ N.	—	37° 3′	Long. C. St. Vinc.	9° 1′ W.
Lat. Funchal	32 38 N.	—	32 38	Long. Funchal ...	16 56 W.
Diff. of latitude...	4 25	Sum 2)	69 41	Diff. of long.	7 55
	60				60
		Mid. lat.	34 50		
In miles	265		90 0	In miles.....	475
		Co. mid. lat.	55 10		

Look for the co. middle latitude 55°, as if it were a course, and for 237, half the difference of longitude (the whole being too great) in a distance column, immediately opposite to which, in the departure column, will be found 194.1; this multiplied by 2, gives the departure 388.2.

Then 132.5, half the difference of latitude, and 194.1, half the departure, being found opposite each other in their respective columns, will give the course 5 points, and half the distance 235, which multiplied by 2, gives the distance 470 miles.

Hence the course from Cape St. Vincent to Funchal, is S. 5 points W. or S. W. by W., and the distance 470 miles.

CASE II.

One Latitude, Course, and Distance given, to find the Difference of Latitude and Longitude.

RULE. With the course and distance find the difference of latitude and departure, as in Case I. of Plane Sailing.

Take the complement of middle latitude as a course, and the departure in its proper column, and against it will stand the difference of longitude in the distance column.

EXAMPLE. A ship from lat. 52° 6′ N., and long. 35° 6′ W., sails N. W. by W. 229 miles: required her present latitude and longitude.

Look for the course 5 points at the bottom of the pages, over which, and opposite the distance 229 in its column, will be the difference of latitude 127.2, and departure 190.4, in their respective columns.

Difference of latitude 127 miles, or	2°	7′	N.
Latitude left	52	6	N.
Latitude in	54	13	N.
Sum of latitudes	2) 106	19	
Middle latitude	53	9	
	90	00	
Co. mid. latitude	36	51	

Look for the co. middle latitude 37° (being the nearest to 36° 51′) as if it were a course, and for half the departure 95.2 in its column, opposite the nearest to which, in the distance column, will be found 158; this, multiplied by 2, gives the difference of longitude 316 miles.

Longitude left	35°	6′	W.
Difference of longitude 316m., or	5	16	W.
Longitude in	40	22	W.

CASE III.

Both Latitudes and Departure given, to find the Course, Distance, and Difference of Longitude.

RULE. With the difference of latitude and departure find the course and distance, as in Case VI. of Plane Sailing; then look for the complement of the middle latitude as a course, and the departure in its column, opposite to which will stand the difference of longitude in the distance column.

EXAMPLE. A ship from latitude 49° 57′ N. and longitude 5° 11′ W., sails between the south and west until she arrives in latitude 38° 27′ N., and finds she has made 440 miles of departure: required the course she has steered, the distance run, and the longitude she is in.

Latitude left	49°	57′	N.	49°	57′	N.
Latitude in	38	27	N.	38	27	N.
Diff. of latitude	11	30		2) 88	24	
	60					
			Mid. lat.	44	12	
In miles	690			90	00	
			Co. mid. lat.	45	48	

One fourth the difference of latitude and departure, that is, 172 5 and 110, are found to correspond nearly under 32° and 33°, the departure opposite the difference of latitude 172.5 being too little under 32° and too much under 33°; therefore the course is about 32½ degrees, and the distances answering to these are 203 and 206; their sum 409, divided by 2, gives one-fourth the distance 204.5, which multiplied by 4, gives the whole distance 818 miles.

The complement of middle latitude 46° taken as a course, with one-fourth the departure 110 in its column, gives in the distance column 153; this, multiplied by 4, will be the difference of longitude 612 miles.

To find the Longitude in.

Longitude left	5°	11′	W.
Difference of longitude 612 miles, or	10	12	W.
Longitude in	15	23	W.

CASE IV.

The Course and both Latitudes given, to find the Departure, Distance, and Difference of Longitude.

RULE. With the course and difference of latitude find the distance and departure, as in Case II. of Plane Sailing.

With the complement of middle latitude as a course, and the departure in its column, find the difference of longitude in the distance column.

EXAMPLE. A ship from latitude 42° 25′ N. and longitude 15° 6′ W., sails N. E. by E. for several days, and then finds by observation that she is in latitude 46° 20′ N.: required the distance she has sailed and her present longitude.

Latitude left	42°	25′ N.	.....	42°	25′	N.
Latitude by observation	46	20 N.	.....	46	20	N.
Difference of latitude	3	55	Sum 2)	88	45	
	60					
			Mid. lat.	44	22	
In miles	235			90	00	
			Co. mid. lat.	45	38	

Over the course 5 points, and opposite half the difference of latitude 117.5, in its column, will be found half the departure 175.4, and half the distance 211; these multiplied by 2, give the whole departure 350.8, and the distance 422 miles.

The co. middle latitude 45° 38′ being taken as a course between 45° and 46°, give opposite half the departure 175.4, in the distance columns, 248 and 244; half the sum of these, *viz.* 246, will be half the difference of longitude, which multiplied by 2, gives the difference of longitude 492.

To find the Longitude in.

Longitude left	15°	6′	W.
Difference of longitude 492 miles, or	8	12	E.
Longitude in.....	6	54	W.

MERCATOR'S SAILING

MERCATOR'S SAILING is the art of finding a ship's place on a plane surface, by considering the length of the degrees of longitude every where equal, and the degrees of latitude expanded in the same proportion as the degrees of longitude are contracted on a globe.

To find the length of the expanded meridian between any two parallels of latitude, or, as it is called, the meridional difference of latitude, the same rules are to be observed as in finding the true or proper difference of latitude; that is, if the latitudes are of the same name, the difference of their corresponding meridional parts (taken from Table III.); but if the latitudes are of contrary names, the sum of those parts, will be the meridional difference of latitude.

In the following Cases, the same examples are introduced as in middle latitude sailing, in order that a comparison may be made between the two methods.

CASE I.

The Latitudes and Longitudes of two Places given, to find the Course and Distance between them.

RULE. Having found the proper difference of latitude, the meridional difference of latitude, and the difference of longitude, by the rules already laid down, seek for the meridional difference of latitude and the difference of longitude, till they are found together in the lat. and dep. columns, and at the top or bottom of the page, according as the meridional difference of latitude is greater or less than the difference of longitude, will stand the course; with that course, and the proper difference of latitude, find the distance, as in Case II. of Plane Sailing.

EXAMPLE. Required the course and distance from Cape St. Vincent, in latitude 37° 3′ N. and longitude 9° 1′ W., to Funchal in Madeira, in latitude 32° 38′ N. and longitude 16° 56′ W.

Lat. Cape St. Vinc.	37° 3′ N.	Mer. parts	2396	Long. C. St. Vin.	9° 1′ W.
Lat. Funchal.....	32 38 N.	Mer. parts	2073	Long. Funchal.	16 56 W.
Diff. of latitude...	4 25	Mer diff. lat.	323	Diff. of long. ...	7 55
	60				60
In miles	265			In miles	475

Seek in the Tables for half the meridional difference of latitude 161.5 and half the difference of longitude 237.5, till they are found against each other in the lat. and dep. columns; the nearest to these are 158.9 and 237.8 in that page marked 5 points at the bottom, which is the course; over that course, and opposite half the proper difference of latitude 132 in its column, is found, in the dist. column, 238, which, multiplied by 2, gives the distance required, 476.

Hence the direct course from Cape St. Vincent to Funchal is S. 5 points W. or S. W. by W., and the distance 476 miles.

CASE II.

One Latitude, Course, and Distance given, to find the Difference of Latitude and Difference of Longitude.

RULE. With the course and distance find the difference of latitude and departure, as in Case I. of Plane Sailing. Hence will be found the latitude in and the meridional difference of latitude.

In one of the lat. columns answering to the course, find the meridional difference of latitude, opposite to which, in the corresponding dep. column, will be the difference of longitude.

EXAMPLE. A ship from latitude 52° 6′ N. and longitude 35° 6′ W., sails N. W. by W 229 miles: required her present latitude and longitude.

Over the course 5 points, and opposite the distance 229, is the difference of latitude 127.2; hence the latitude come to, and the meridional difference of latitude will be found as follows:

Latitude left	52° 6′ N.	Mer. parts	3675
Diff. of latitude 127 miles, or	2 7 N.		
Latitude in	54 13 N.	Mer. parts	3887
		Mer. diff. of lat.	212

Over the course 5 points, and opposite half the meridional difference of latitude 106 in a lat. column, will be found 158.8 in a dep. column, which, multiplied by 2, gives the difference of longitude 317.6.

To find the Longitude in.

Longitude left	35°	6′	W.
Difference of longitude 318 miles, or	5	18	W.
Longitude in	40	24	W.

CASE III.

Both Latitudes and Departure given, to find the Course, Distance, and Difference of Longitude.

RULE. With the difference of latitude and departure find the course and distance, as in Case VI. of Plane Sailing.

With the course and meridional difference of latitude, find the difference of longitude, as in the last Case.

EXAMPLE. A ship from latitude 49° 57′ N. and longitude 5° 11′ W., sails between the south and west until she arrives in latitude 38° 27′ N., and finds she has made 440 miles of departure; required the course she has steered, the distance run, and the longitude she is in.

Latitude left...	49°	57′ N.	Mer. parts		3470
Latitude in ...	38	27 N.	Mer. parts		2503
Diff. of latitude	11	30	Mer. diff. latitude ...		967
		60			
Miles.....	690				

One-fourth the difference of latitude and departure, that is, 172.5 and 110, are found to correspond nearly under 32° and 33°, the departure opposite the difference of latitude 172.5 being too little under 32° and too much under 33°; therefore the course is about 32½ degrees, and the distances answering to these are 203 and 206: their sum 409, divided by 2, gives one-fourth the distance 204.5, which, multiplied by 4, gives the whole distance 818.

One-fourth the meridional difference of latitude 241.7 in one of the lat. columns of the page marked with the course 32° at the top, gives in the dep. column 151.0, and the same with the course 33° at the top gives 156.9; the sum of these is 307.9, which, divided by 2, gives 153.9; this, multiplied by 4, gives the difference of longitude 615.6.

To find the Longitude in.

Longitude left	5°	11′	W.
Difference of longitude 616 miles, or	10	16	W.
Longitude in	15	27	W.

CASE IV.

Both Latitudes and Course given, to find the Distance, and Difference of Longitude.

RULE. With the course and proper difference of latitude, find the distance and departure, as in Case II. of Plane Sailing. Then, with the course and meridional difference of latitude, find the difference of longitude as before.

EXAMPLE. A ship from latitude 42° 25′ N, and longitude 15° 6′ W., sails N. E. by E. for several days, and then finds by observation that she is in latitude 46° 20′ N.: required the distance she has sailed and her present longitude.

Latitude left.....	42°	25′ N.	Mer. parts		2815
Latitude in by obs.	46	20 N.	Mer. parts		3144
Diff. of latitude ...	3	55	Mer. diff. latitude ...		329
	60				
In miles	235				

Over the course 5 points, and opposite half the difference of latitude 117.5, in its column, will be found half the distance 211 in its proper column; this, multiplied by 2, gives the whole distance 422.

Over the same course, and opposite half the meridional difference of latitude 164.5, found in a latitude column, stands 246.1 in the corresponding dep. column; which, multiplied by 2, gives the difference of longitude 492.2.

To find the Longitude in.

Longitude left.....	15°	6′	W.
Difference of longitude 492 miles, or...	8	12	E.
Longitude in	6	54	W.

USE OF MERCATOR'S CHART.

To find the Latitude and Longitude of a Place on the Chart.

With a pair of compasses take the least distance between the given place and the nearest parallel of latitude; apply that distance, the same way, on one of the graduated meridians, one foot of the compasses being fixed at that point where the parallel cuts the graduated meridian, and the other will shew the latitude of the place.

The least distance between the given place and one of the nearest meri-

dians being applied in the same manner to either of the graduated parallels, will point out the longitude of the place.

To lay down upon the Chart any Place whose Latitude and Longitude are given.

Lay the edge of a scale over the given latitude, and with a pair of compasses take from one of the divided parallels the distance between the given longitude and the nearest meridian line, this being applied along the edge of the scale, from that point where the scale intersects the meridian line, the same way that the longitude lies, will point out the place required.

In this manner a ship's track is usually pricked off at sea, her latitude and longitude being laid down every day at noon; and the ship's places connected by pencil lines drawn between them.

To find the Course or Bearing between two Places on the Chart.

Lay the edge of a scale over the given places, and take the least distance between the centre of one of the compasses drawn on the chart, and the edge of the scale; move this extent along so that one point of the compass may touch the edge of the scale, while the other is to be kept in a perpendicular position to it, with respect to the edge of the scale; then that other point will generate an imaginary line passing through the centre of the compass on the chart, which will shew the course or bearing.

To find the Distance between any two Places on the Chart.

1. If the given places lay under the same meridian, find their latitudes on the chart, and the difference or sum of these, according as the places lay on the same or on different sides of the equator, will give the distance.

2. If the given places lay in the same parallel of latitude, take half the distance between them, and placing one foot of the compasses in the graduated meridian on their latitude, observe what latitudes the other foot points to both above and below; the difference between these will be their distance.

3. But if the given places differ both in latitude and longitude, take the distance between them, and apply it to either of the graduated meridians, so that one foot of the compasses may be as much above one place as the other is below the other place; then the degrees or minutes contained between the points of the compasses, will be the distance required, which may be reduced to miles or leagues.

But if the places lay nearly in a parallel, and their distance is considerable, it will conduce to accuracy if the middle latitude between the two places be found; then half their distance being applied alternately above and below the middle latitude, will give the distance:

Or, a degree may be taken near the middle parallel, and the number of these degrees and parts contained between the two places being measured along the edge of the scale, will give the distance.

The distance may also be found in the following manner. Find the dif.

ference of latitude between the given places, and take it from the equator, or one of the graduated parallels; then lay the edge of a scale over the given places, and move or slide one point of the compasses along the edge of the scale (keeping both points parallel to the meridians) until the other point just touches a parallel. Now, the distance between the place where the point of the compasses rested, and the point of intersection of the edge of the scale and parallel, being applied to the equator, or one of the graduated parallels, will give the distance in degrees and parts, which may be reduced to miles.

The Course steered and Distance run from any given Place being known, to find the Ship's Place on the Chart.

Lay the edge of the scale over the given place in the direction of the ship's course; then take the distance run from that part of one of the graduated meridians opposite the given place and the supposed place of the ship, which lay off from the given place along the edge of the scale, and it will shew the place of the ship. Or, placing the scale as before directed, take the given distance from one of the graduated parallels; put one foot of the compasses in that point of a parallel that is cut by the edge of the scale, and the other foot will reach to a certain place along the edge of the scale: now this foot remaining in the same position, draw in the other point of the compasses until it just touch the above parallel, without crossing it; apply this extent to the graduated parallel, and it will give the difference of latitude: hence the latitude in will be known, through which a parallel being drawn, that point where it intersects the edge of the scale will be the ship's place.

TIDES.

A TIDE is that regular motion of the waters of the ocean by which they rise and fall in certain intervals of time. The rising of the water is called the *flux*, or *flood;* and its falling, the *reflux*, or *ebb*. When the water has attained its greatest height it is said to be *high water*, and when it is done falling it is called *low water*.

The *Tidal Establishment of the Port is the time of the first High Water* on the afternoon of the day of full and change of the moon.

A *constant* is the difference in time between the tidal establishment of a standard port and that of some other port; so that knowing the constant and also the tidal hour on any day at the standard port, the time of high water at the other port is found by adding or subtracting the constant.

The following are the principal Rules for finding the time of high water at any place.

1. *By the Moon's Age.*—This is a very old method, and, at best, only a rough estimate; it may be in error from one to two hours.

RULE.—To the epact of the year add the epact of the month, and the day of the month; the result if less than 29 days 13h. is the *moon's age* at noon of the day; if the result exceeds 29d. 13h., subtract 29d. 13h. for the moon's age. In leap years subtract one day in January and February.

Note.—Every almanac in the present day gives the moon's age, or at least the time of new moon, from which the moon's age can be reckoned, therefore the above process is unnecessary.

Multiply the moon's age by 4 and divide the product by 5; the result is the time of the *moon's meridian passage.*

For the Time of High-Water.—To the time of the moon's meridian passage add the tidal establishment of the port.

If the sum exceeds 12h. 24m., or 24h. 48m., it gives, in the former case next morning's tide, in the latter case the afternoon tide of the next day: hence, by subtracting those quantities as required you get the P.M. time of High Water for the given day.

Ex.—Find the time of High Water at London Bridge, July 18th, 1880.

Moon's Age, Naut. Alm. 11d.
4
5)44
8h. 48m.*
Establishment 1 58
In error 32 minutes.
P.M. 10 56

* The minutes are obtained by multiplying the 4 *remainder* by 60 and dividing by 5.

Ex.—Find the time of High Water at Devonport, August 2nd, 1880.

Moon's Age, Naut. Alm. 26d.
4
5)104
20h. 48m.
Establishment 5 43
In error nearly 1¼ hours. 26 31
24 48
P.M. 1 43

2. The work known as the "*Admiralty Tide Tables*" gives, in the first 97 pages, *daily* tide tables (*i.e.* morning and afternoon times of high water) for 24 of the chief ports of the United Kingdom, including Brest: these are recognised as *Standard Ports.*

At pp. 104 to 108 are also found a collection of *Tidal Constants* for 231 places on the coasts of the United Kingdom and of Europe; the constant for a given port being applied according to its sign (+ or —) to the times belonging to the standard port to which it is referred, will give (approximately) the time of high water at that port.

A port other than the standard one being given, to find the A.M. and P.M. times of high water on a certain day, *proceed as follows:*—

1. Turn to the "Tidal Constants"; seek for the given port, take out the *constant,* and note its sign (+ or —) as well as the standard port for reference.

2. In the first part of the book, turn to the given *month,* seek out the *standard port,* and for the given day will be seen the morning and afternoon times of high water at that port. If a blank or dash occurs in either column, it indicates *no high water,* and consequently there is but one high water on that day.

3. In every case take out the tidal hour at standard port of reference, and under it write the tidal constant.

4. *When the constant is* +, that is, *additive* to the tidal hours at standard port:

(*a*) *Both tides* being *given* for the day at the standard port—
If sum of morning tide and constant is less than 12h. it is the A.M. tide required. Then,
If sum of afternoon tide and constant is less than 12h., it is the P.M. tide required; but if sum is more than 12h., there is *no* P.M. tide.
Or,—If sum of morning tide and constant is more than 12h., reject 12h. and it is the P.M. tide required. Then,
To afternoon tide of *previous* day add constant, and if sum is less than 12h. there is *no* A.M. tide; but if sum is more than 12h. reject 12h. and it is the A.M. tide required.

(*b*) *No morning tide* being *given* at the standard port—
To afternoon tide of *previous* day add constant; if sum is less than 12h. there is *no* A.M. tide; but if sum is more than 12h., reject 12h. and it is the A.M. tide required. Then,
To afternoon tide of given day add constant, and the sum is the P.M. tide required.

(*c*) *No afternoon tide* being *given* at the standard port—
If sum of morning tide and constant is less than 12h. it is the A.M. tide required, and there is *no* P.M. tide; but if the sum is more than 12h., reject 12h., and it is the P.M. tide required; in the latter case, to afternoon tide of *previous* day add constant, and if sum is less than 12h. there is *no* A.M. tide; but if sum is more than 12h. reject 12h. and it is the A.M. tide required.

5. *When the constant is* —, that is, *to be subtracted* from the tidal hours at standard port:

(*d*) *Both tides* being *given* for the day at the standard port, and constant *less* than both—
From morning tide subtract constant, and remainder is the A.M. tide required.
From afternoon tide subtract constant, and remainder is the P.M. tide required.

(*e*) *Both tides* being *given*, and constant *greater* than morning tide, but *less* than afternoon tide—
Disregard the morning tide at standard port as of no value; for there can be *no* A.M. tide at the place for which the tide is sought.
From afternoon tide subtract the constant, and remainder is the P.M. tide required.

(*f*) *Both tides* being *given*, and constant *greater* than both—
Disregard the morning tide at standard port as of no value.
To afternoon tide add 12h. and subtract the constant; the remainder is the A.M. tide required. Then,
If constant is less than morning tide of *next* day there is *no* P.M. tide; but
If constant is greater than morning tide of *next* day, add 12h. to the latter, subtract the constant, and remainder is the P.M. tide required.

(*g*) *No morning tide* being *given* at the standard port—
If constant is less than afternoon tide, there is *no* A.M. tide. Then,
From afternoon tide subtract constant, and remainder is the P.M. tide required.
But, *if constant is greater than afternoon tide* add 12h. to the latter, subtract constant, and remainder is the A.M. tide required. Then,
If constant is less than morning tide of *next* day, there is *no* P.M. tide; but
If constant is greater than morning tide of *next* day, add 12h. to the latter, subtract constant, and remainder is the P.M. tide required.

(*h*) *No afternoon tide* being *given* at the standard port—
From morning tide subtract constant, and the remainder is the A.M. tide required. Then,
If constant is less than morning tide of *next* day, there is *no* P.M. tide: but
If constant is greater than morning tide of *next* day, add 12h. to the latter, subtract constant, and remainder is the P.M. tide required.

3. *By the Nautical Almanac, and the Difference* (CONSTANT) *of the Tidal Establishments.*

In the Nautical Almanac the Mean Time of High Water at London Bridge is given for every day in the year, on the assumption that the Time of High Water on full and change days, or the *Establishment of the Port*, is 1h. 58m. The first high tide which happens after Mean Noon of any day is inserted in the 1st column, and the second in the 2nd column; the day used being the astronomical one.

Where a line (—) is inserted, it indicates that there is only *one* high tide on that astronomical day. Thus, on Jan. 9, 1880, there is only one high tide; it occurs at 11h. 44m., but the succeeding high tide does not take place until 20m. after mean noon of Jan. 10.

The Table which follows the Tidal Table for London Bridge, gives the times of High Water on *full and change days* (reckoned from Apparent noon) at numerous places on and near the coast of Great Britain (Naut. Alm. p. 478–9).

These are the Tidal *Establishments* for the given Ports; and the difference between any one and the Establishment for London Bridge (which is 1h. 58m.) gives a *constant*, which is to be applied to the Tidal Hour at London Bridge for any given day.

The *constant* for the Port is additive if its Tidal Establishment exceeds that of London Bridge, otherwise subtractive.

Ex.—Find the A.M. and P.M. tides at Port Glasgow, July 11th, 1880.

	h. m.		h. m.			h. m.	
London Bridge Estab.	1 58	London Bridge, July 10d.	16 9				
Port Glasgow „	18						
		„ 11th.	4 9	A.M.	July 11d.	4 27	P.M.
Constant —	1 40	Constant —	1 40			— 1 40	
		Port Glasgow, July 11th.	2 29	A.M.	. . .	2 47	P.M.

Ex.—Find the A.M. and P.M. tides at Sunderland, Sept. 25th, 1880.

	h. m.		h. m.			h. m.	
London Bridge Estab.	1 58	London Bridge, Sept. 24d.	17 33				
Sunderland „	3 22						
		25th.	5 33	A.M.	Sept. 25th.	5 53	P.M.
Constant +	1 24	Constant +	1 24			+ 1 24	
		Sunderland, Sept. 25th...	6 57	A.M.	. . .	7 17	P.M.

4. *By the Moon's Meridian Passage and the Establishment of the Port*:—Find the time of the moon's Mer. Pass. at place, from Naut. Alm. (Green. Mer. Pass.), and applying thereto the correction for Long. + if West, but — if East (Table XVI., Norie's Epitome); to this time apply the correction with its proper sign, from Table p. 65 (entering Table with ☽'s Mer. Pass. at side, and ☽'s Semidiam. at top); to the result add the Establishment of the Port, for the time of high water on the afternoon of the given day, *unless* such sum exceeds 12h. 24m., or 24h. 48m., in which case subtract one or other of these times, as necessary, from it, and the remainder will be the *approximate* time of high water on the afternoon of the given day. For the A.M. tide subtract 24m. from the P.M. tide.

☽'s Mer. Passage.	☽'s Semidiameter. 14′ 30″	15′ 30″	16′ 30″	☽'s Mer. Passage.	☽'s Mer. Passage.	☽'s Semidiameter. 14′ 30″	15′ 30″	16′ 30″	☽'s Mer. Passage.
H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0 0	−0 4	0 0	+0 5	12 0	6 0	−0 55	−1 2	−1 12	18 0
0 30	−0 10	−0 8	−0 5	12 30	6 30	−0 46	−0 51	−0 58	18 30
1 0	−0 17	−0 16	−0 15	13 0	7 0	−0 32	−0 34	−0 37	19 0
1 30	−0 24	−0 25	−0 25	13 30	7 30	−0 17	−0 16	−0 14	19 30
2 0	−0 31	−0 34	−0 36	14 0	8 0	−0 1	+0 3	+0 9	20 0
2 30	−0 38	−0 41	−0 46	14 30	8 30	+0 8	+0 15	+0 24	20 30
3 0	−0 44	−0 49	−0 55	15 0	9 0	+0 14	+0 21	+0 32	21 0
3 30	−0 50	−0 56	−1 4	15 30	9 30	+0 16	+0 24	+0 36	21 30
4 0	−0 55	−1 2	−1 12	16 0	10 0	+0 15	+0 23	+0 34	22 0
4 30	−0 58	−1 6	−1 16	16 30	10 30	+0 12	+0 19	+0 29	22 30
5 0	−1 0	−1 8	−1 19	17 0	11 0	+0 7	+0 14	+0 23	23 0
5 30	−0 59	−1 7	−1 18	17 30	11 30	+0 2	+0 7	+0 15	23 30
6 0	−0 56	−1 2	−1 12	18 0	12 0	−0 4	0 0	+0 5	24 0

Ex.—Required the time of High Water at Reikiavik, Iceland, on June 15th, 1880.

	h.	m.	
Moon's Mer. Pass. at Greenwich	5	48	
Daily Var. 46m. and Long. 22° W. (Tab. XVI.)	+	3	
Mer. Pass. at Reikiavik	5	51	
Moon Semid. 15′ 30″ and Mer. Pass., Table	− 1	2	
	4	49	
Establishment of Port, Reikiavik	5	0	
Tidal hour at „	9	49	P.M.
	−	24	
„ „	9	25	A.M.

ON FINDING THE

LATITUDE BY OBSERVATION.

THE latitude of a place is its distance from the equator, either north or south, and is measured by an arch of a meridian, contained between the zenith and the equinoctial: hence, if the distance of any heavenly body from the zenith when on the meridian, and its declination, or number of degrees and minutes it is to the northward or southward of the equinoctial, be given, the latitude may thence be found.

To find the Latitude of a Place by the Meridian Altitude of the Sun.

RULE. To the observed altitude of the sun's lower limb add the sun's semidiameter (16 minutes); but if the upper limb be observed subtract it;

from this sum or remainder subtract the dip answering to the height of the eye,* (found in Table V.) when the altitude is taken by a fore observation; or add it in a back observation; and the result will be the apparent altitude of the sun's centre.

From the apparent altitude of the sun's centre subtract the refraction answering to that altitude, taken from Table IV., and the remainder will be the true altitude of the sun's centre, which subtracted from 90°, will give the sun's true meridian zenith distance; to be called north or south, according as the observer is to the north or south of the sun, at the time of observation.†

Take the sun's declination from Table X., noting whether it be north or south. Then, if the zenith distance and declination be both north or both south, add them together; but if one be north and the other south, subtract the less from the greater, and the sum or difference will be the latitude, of the same name with the greater.

NOTE. As the sun's declination in Table X. is adapted to the meridian of Greenwich, when the longitude of the ship is considerable, the declination should be corrected by a number of minutes taken from Table XI., placed at the bottom for that purpose, with the nearest degree answering to the declination at the top, and the nearest degree of longitude in either of the side columns; the correction being found is to be applied to the declination from Table X., as directed at the head of XI.

EXAMPLE I.

June 19, 1878, the meridian altitude of the sun's lower limb was 43° 18′, the observer being north of the sun, and his eye elevated 18 feet above the surface of the sea: required the latitude of the place of observation.

	°	′	
Obs. alt. of sun's *lower limb*	43	18	
Sun's semidiameter	+	16	
Obs. alt. sun's centre	43	34	
Dip of the horizon (Table V.)	−	4	
App. alt. sun's centre	43	30	
Refraction (Table IV.)	−	1	
True alt. sun's centre	43	29	
	90		
Sun's zenith distance	46	31	N.
Sun's declination	23	27	N.
Latitude	69	58	N.

EXAMPLE II.

September 21, 1878, *in* longitude 60° E., the meridian altitude of the sun's lower limb was 56° 26′, the observer being south of the sun, and the height of his eye 26 feet: required the latitude.

	°	′	
Obs. alt. sun's *lower limb*	56	26	
Semidiameter + 16′, Dip of horizon (V.) − 5	+	11	
App. alt sun's centre	56	37	
Refraction (Table IV.)	−	1	
True alt. sun's centre	56	36	
	90		
Sun's zenith distance	33	24	S.
Sun's declination 0° 40′, Corr. for long. 60° E. + 4	0	44	N.
Latitude	32	40	S.

* When the horizon under the sun is obstructed by land, the dip is to be taken from Table VIII. with the height of the eye, in feet, at the top, and estimated distance from the land in the left side column.

† It is a custom among seamen to add 11 or 12 minutes to the observed altitude of the lower limb (being the difference between the semidiameter and the dip only), and therefore omit the correction for refraction altogether; this neglect, will frequently produce an error of several miles in the latitude, especially, when the meridian altitude is small.

EXAMPLE III.

January 9, 1878, in longitude 116° W., the meridian altitude of the sun's upper limb was 69° 14′ South, the observer being about 3 miles from the land under the sun, and his eye elevated 22 feet: required the latitude.

		°	′
Obs. alt. sun's *upper limb*		69	14 S.
Semidiameter	− 16′	−	21
Dip (Table VIII.)	− 5		
App. alt. sun's centre		68	53
Refraction (Table IV.)		−	0
True alt. sun's centre		68	53
		90	
Sun's zenith distance		21	7 N.
Sun's declination	22° 5′	22	2 S.
Corr. for long., 116° W.	− 3		
Latitude		0	55 S.

EXAMPLE IV.

December 25, 1878, in longitude 35° W., the meridian altitude of the sun's lower limb, by a back observation, was 16° 28′ South, the height of the eye being 20 feet: required the latitude.

		°	′
Obs alt. sun's *lower limb*		16	28 S.
Semidiameter	+ 16′	+	20
Dip (Table V.)	+ 4		
App. alt. sun's centre		16	48
Refraction (Table IV.)		−	3
True alt. sun's centre		16	45
		90	
Sun's zenith distance		73	15 N.
Sun's declination	23° 24′	23	24 S.
Corr. for long., 35° W.	− 0		
Latitude		49	51 N.

When the altitude of the sun's lower limb is taken by a fore observation, the correction for the joint effect of semidiameter, dip, and refraction may be obtained *at once* by Table IX., which is to be entered with the observed altitude in the left-side column, and the height of the eye at the top, corresponding to which will be found the correction in minutes and tenths; and as in this Table the sun's semidiameter is assumed at 16 minutes, its variation from that quantity, in each month of the year, is given at the bottom of the Table, and is to be added to, or subtracted from, the correction found in the Table according as the sign + or − is prefixed to it.

The simplicity of this Table will appear sufficiently obvious in the following Examples:

EXAMPLE V.

August 21, 1879, in longitude 105° W., the meridian altitude of the sun's lower limb was 77° 51′, the observer being south of the sun, and the height of his eye 30 feet: required the latitude.

		°	′
Obs. alt. sun's lower limb		77	51
Corr. from Table IX	10′.4		
Corr. for May	− 0.2		
	10.2 or	+	10
True alt. of sun's centre		78	1
		90	
Sun's zenith distance		11	59 S.
Sun's declin., Table X.	12° 10′	12	4 N.
Corr. for. long., 105° W.	− 6		
Latitude		0	5 N.

EXAMPLE VI.

November 21, 1878, in longitude 65° E., the meridian altitude of the sun's lower limb was 47° 37′ S., the height of the eye being 18 feet: required the latitude.

		°	′
Obs. alt. sun's lower limb		47	37 S.
Corr. from Table IX.	11′.0		
Corr. for November	+ 0.2		
	11.2 or	+	11
True alt. of sun's centre		47	48
		90	
Sun's zenith distance		42	12 N.
Sun's declin., Table X.	19° 58′	19	56 S.
Corr. for long., 65° E.	− 2		
Latitude		22	16 N.

The sun's declination, as given in Table X., is calculated particularly for the years 1876, 1877, 1878, and 1879, but will serve for several subsequent years by applying the correction from Table XII., given at the bottom of pages 71 and 72 of Table X.; it contains the minutes of change in the declination that takes place in periods of four years. The Table is to be entered with the period of years in either of the side columns, and the mouth and nearest day at the top; the corresponding minutes of correction then found, are to be added to, or subtracted from, the declination taken from Table X., answering to the number of years, reckoning in periods of four years, prior to that of the given year, as directed at the head of the column; that is, the correction is to be added when the declination is increasing, or subtracted when decreasing.

EXAMPLE. Required the sun's declination at noon on February 20th, 1895, at the meridian of Greenwich.

The year 1895, being a period of 16 years after 1879, find the declination in Table X., for the given day in the year 1879, which is 10° 56′ S.; opposite the period of 16 years, and under the 19th of the month, will be found the correction 2′, which is to be subtracted from the above declination 10° 56′ S., and the remainder 10° 54′ S. will be the required declination.

To find the Latitude by the Meridian Altitude of a Star.

RULE. From the observed altitude of the star subtract the dip and refraction from Tables IV. and V., and the remainder will be the star's true altitude, which subtracted from 90° will give the zenith distance, to be called north or south, according as the observer is north or south of the star at the time of observation. Take the star's declination from Table XV., and reduce it to the time of observation.

Then, if the zenith distance and declination be both north or both south, add them together; but if one be north and the other south, subtract the less from the greater, and the sum or difference will be the latitude, of the same name with the greater.

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* The right ascensions and declinations of the stars contained in Table XV. being computed for the beginning of the year 1870, if their places are required for any time subsequent to that year, the annual variation both in right ascension and declination must be multiplied by the number of years elapsed since that time, and the product will be the variation from the beginning of the year 1870 to the given year. This variation must always be added to the right ascension for 1870; but the variation in declination is additive or subtractive according as the sign + or − is prefixed to the annual variation; then the sum or remainder will be the right ascension and declination for the given year.

EXAMPLES. Required the declination of the Stars Aldebaran and Fomalhaut for the year 1880.

	°	′	″			°	′	″	
Aldebaran's declination 1870 ...	16	14	44	N.	Fomalhaut's declination 1870 ...	30	18	38	S.
Ann. var. +7″.62×10=76″.20=	+	1	16		An.var. −18″.97×10=189″.70=	−	3	10	
Aldebaran's declination 1880 ...	16	16	0	N.	Fomalhaut's declination 1880 ...	30	15	28	S.

EXAMPLE I.

January 20, 1880, about 8 o'clock in the evening, the meridian altitude of the star Aldebaran was 52° 36′, the observer being North of the star, and the height of his eye 20 feet: required the latitude.

	°	
Obs. alt. of Aldebaran	52	36
Dip of horizon (Table V.)	—	4
App. alt. of Aldebaran	52	32
Refraction (Table IV.)	—	1
True alt. of Aldebaran	52	31
	90	
Star's zenith distance	37	29 N.
Star's declination for 1880	16	16 N.
Latitude	53	45 N.

EXAMPLE II.

July 16, 1880, about 3 o'clock in the morning, the meridian altitude of the star Fomalhaut was 73° 36′ South, the height of the eye being 24 feet: required the latitude.

	°	′	
Obs. alt. of Fomalhaut	73	36	S.
Dip of horizon (Table V.)	—	5	
App. alt. of Fomalhaut	73	31	
Refraction (Table IV.)	—	0	
True alt. of Fomalhaut	73	31	
	90		
Star's zenith distance	16	29	N.
Star's declination for 1880	30	15	S.
Latitude	13	46	S.

To find the Latitude by an Altitude of the Polar Star.

RULE. To the sun's right ascension, taken from Table XVIII, add the time since noon when the altitude was observed; their sum (rejecting 24 hours, if it exceeds that quantity,) will be the right ascension of the meridian, with which enter Table XVII, and add the corresponding correction to, or subtract it from, the star's true altitude, as directed in the Table; the sum or remainder will be the latitude.*

EXAMPLE I.

May 21, 1870, the altitude of the Polar Star was observed to be 50° 18′, at 10h. 20m. past noon, the height of the eye being 20 feet: required the latitude.

	h.	m.		
Sun's right ascension, May 21	3	51		
Time of observation	10	20		
Right ascension of meridian	14	11		
	°			
Obs. alt. of Polar Star	50	18		
Dip of the horizon, 4′ / Refraction, 1	—	5		
Star's true altitude	50	13		
Corr. from Table XVII to be added	1	20		
Latitude	51	33	N.	

EXAMPLE II.

December 30, 1870, at 6h. 30m. past noon, the altitude of the Polar Star was 27° 36′, the height of the eye being 30 feet: required the latitude.

	h.	m.		
Sun's right ascension	18	37		
Time of observation	6	30		
	25	7		
Subtract	24			
Right ascension of meridian	1	7		
	°	′		
Obs. alt. of Polar Star	27	36		
Dip of the horizon, 5′ / Refraction, 2	—	7		
Star's true altitude	27	29		
Corr. from Table XVII to be sub...	1	23		
Latitude	26	6	N.	

* The above Rule will give the latitude nearly; but if greater accuracy be required, the latitude so found should be corrected by adding a number of minutes taken from Table XVII*, with the R. A. of the meridian from one of the side columns, and the approximate latitude at the top.

To find the Time of a Star's Passage over the Meridian of any Place.

RULE. From the star's right ascension, found in Table XV., subtract the sun's right ascension, taken from Table XVIII., (increasing the star's right ascension by 24 hours, if it be less than the sun's,) and the remainder will be the time of the star's passing the meridian in the afternoon; but if it exceed 12 hours, subtract 12 hours from it, and the remainder will be the time after midnight.

EXAMPLE I.

At what time will the star Aldebaran come to the meridian on January 20th, 1880?

	h.	m.
Aldebaran's right ascension.....	4	29
	24	
	28	29
Sun's right ascension (Table XVIII.)	20	8
Time of star's passing the meridian in the afternoon	8	21

EXAMPLE II.

At what time will the star Fomalhaut come to the meridian on July 12th, 1880?

	h.	m.
Fomalhaut's right ascension	22	51
Sun's right ascension (Table XVIII.)	7	25
	15	26
	12	
Time of star's passing the meridian in the morning	3	26

The times of the principal stars passing the meridian may be found more expeditiously and correctly by Table XVI., where they are given for every fifth day of each month throughout the year, beginning on the first day of each month: and since the stars perform a revolution, or return to the meridian, in 23 hours, 56 minutes, and 4 seconds, of mean solar time, that is, about 4 minutes earlier every day, when the time of their transit is required for any intermediate day, it may be found by multiplying the number of days since the preceding one given in the Table, by 4, and subtracting the product from the time of the transit on that day; the remainder will then be the time of the transit on the day required. Suppose, for example, we want to know at what time the star Aldebaran will pass the meridian on February 14th. Now, by the Table, it appears that the star will pass the meridian, on the 11th of that month, at 6h. 46m. P. M.; then to find the time of its transit on the 14th, multiply 3, the number of days since the 11th, by 4; the product, 12 minutes, subtracted from 6h. 46m., will give 6h. 34m., the time of the star's passage over the meridian P. M. on the 14th February.

By the assistance of this Table the method of finding the latitude by the meridian altitude of a star will be greatly facilitated; for when we know at what time nearly a star will pass the meridian, and its approximate altitude at that time, there can be no difficulty in making the requisite observation to determine the latitude: these opportunities occur frequently in the course of a clear night, and may be put in practice by any person otherwise unacquainted with the stars in the heavens.

In the first place, the altitude of any star when passing the meridian, may be found by adding together the co-latitude of the place of observation and the declination of the star, when they are of the same name, or taking their difference when of contrary names; the altitude to be reckoned from the south point of the horizon, when the latitude is north, and the contrary when south; but when the sum exceeds 90°, it is to be taken from 180°,

and reckoned from the opposite point of the horizon, that is, from the north in north latitude, and from the south in south latitude.

Thus having the time of the star's transit, or passage over the meridian, by the Table, and its meridian altitude nearly by calculation, set the index of the quadrant to that altitude, and a few minutes before the time of the star's transit, direct the sight towards the north or south points of the horizon, as shewn above, and the reflected image of the star will be perceived in the horizon-glass, upon or near the horizon, which being brought into contact with it, and kept so until it arrives at its greatest or meridian altitude, and then read off the quadrant, the latitude may be found by calculation.

To find the Time of the Sun's Rising or Setting, and the Length of the Day or Night.

RULE. Look for the latitude of the given place in one of the side columns of Table XIV., and for the declination of the sun (taken from Table X.) at the top; then, opposite the former, and under the latter, will be the time of the sun's setting, when the latitude and declination are of the same name, or of its rising when they are of contrary names; and this subtracted from 12 hours, will give the time of the sun's rising in the former case, or of its setting in the latter: double the time of his rising will be the length of the night, and double the time of his setting, the length of the day.

EXAMPLE I. Required the time of the sun's rising and setting, with the length of the day and night, in latitude 49° N., on June 10th, 1879,

By Table X. the sun's declin. is 23° 1′ N.

Opposite the latitude 49°, and under the declin. 23°, is found the time of the sun's setting ..... 7h. 57m.

12

Time of sun's rising 4 3

Double the setting is length of the day 15 54

Double the rising is length of the night 8 6

EXAMPLE II. Required the time of the sun's rising and setting, with the length of the day and night, at Edinburgh, in latitude 55° 57′ N., on November 17th, 1878.

By Table X. the sun's declination is 19° 2′ S.

Opposite the latitude 56°, and under the declin. 19°, is found the time of the sun's rising ..... 8h. 3m.

12

Time of sun's setting 3 57

Double the setting is length of the day 7 54

Double the rising is length of the night 16 6

OF THE

VARIATION OF THE COMPASS.

THE VARIATION OF THE COMPASS is the deviation of the points of the Mariner's Compass from the corresponding points of the horizon, and is termed *east* or *west* Variation, according as the magnetic needle, or north point of the compass, is inclined to the eastward or westward of the true north point of the horizon.

The variation of the compass is found by comparing together the sun's true and magnetic amplitudes.

The TRUE AMPLITUDE of any celestial object is an arch of the horizon contained between the true east or west points thereof, and the centre of the object at the time of its rising or setting; or, it is the degrees and minutes the object rises or sets to the northward or southward of the true east or west points of the horizon.

The MAGNETIC AMPLITUDE is an arch contained between the east or west points of the compass, and the centre of the object at rising or setting: or it is the bearing of the object, by compass, when in the horizon.

To find the Sun's true Amplitude.

RULE. Look for the latitude of the given place in one of the left-hand columns of Table XIII. and for the sun's declination (taken from Table X.) at the top of the same Table. Opposite the former, and under the latter, will stand the sun's true amplitude, which is to be reckoned from the east in the morning, and from the west in the afternoon, towards the north or south, according to the declination.

NOTE. When the minutes of the latitude or declination are nearly 30, or half a degree, the mean of the amplitudes found for the two nearest degrees will give the true amplitude.

EXAMPLE I.

Required the sun's true amplitude at rising in latitude 50° N., when the sun's declination is 9° N.

Opposite latitude 50°, and under the declination 9°, stands 14° 5′, to be reckoned from the east, towards the north, because it is at rising, and the declination is north; hence the sun's true amplitude at rising is E. 14° 5′ N. or E. by N. ¼ N.

EXAMPLE II.

Required the sun's true amplitude at rising and setting in latitude 34° 29′, when the declination is 18° N.

	°	′
True amplitude by Table XIII. for lat. 34° and declination 18° ...	21	53
" " " " 35 and declination 18 ...	22	10
2)	44	3
Sun's true amplitude required	22	1

Hence the sun's true amplitude at rising is E. 22° 1′ N., or E. N. E. nearly; and at setting W. 22° 1′ N. or W. N. W. nearly.

EXAMPLE III.

On what points of the horizon will the sun rise and set on November 15th, 1878, at St. Petersburgh, in latitude 59° 56′ N.?

	°	′
By Table X. the sun's declination is 18° 32′ S.		
True amplitude by Table XIII. for lat. 60° and declination 18° ...	38	10
" " " " 60 and declination 19 ...	40	38
2)	78	48
Sun's true amplitude required	39	24

Hence the sun will rise E. 39° 24′ S., or S. E. ¼ E., and set W. 39° 24′ S., or S. W. ¼ W.

To find the Variation of the Compass by the true and magnetic Amplitudes.

RULE. Having found the true amplitude by the preceding method, and the magnetic amplitude by a compass, if they be both north, or both south, their difference will be the variation; but if one be north, and the other south, their sum will be the variation; and to know whether it be easterly or westerly, suppose the observer looking towards that point of the compass representing the magnetic amplitude; then, if the true amplitude be to the right hand of the magnetic, the variation is east, but if to the left hand, it is west.

EXAMPLE I.

July 3, 1878, in latitude 9°10′S., the sun was observed to rise E. 12°30′N.: required the variation of the compass.

	°	′	
By Table XIII. the sun's true amplitude is E....	23	18	N.
By compass the sun's magnetic amplitude is E...	12	30	N.
Variation of the compass is	10	48	West, because the true amplitude is to the left of the magnetic.

EXAMPLE II.

September 30, 1878, in latitude 26°32′N., the sun's centre was observed to set W. 9°15′S.: required the variation of the compass.

	°		
By Table XIII. the sun's true amplitude is W....	3	21	S.
By compass the sun's magnetic amplitude is W..	9	15	S.
Variation of the compass is	5	54	East, because the true amplitude is to the right of the magnetic.

EXAMPLE III.

October 18, 1878, in latitude 9°7′N., the sun's centre was observed to rise E. 1°40′N.: required the variation of the compass.

	°	′	
By Table XIII. the sun's true amplitude is E....	9	37	S.
By compass the sun's magnetic amplitude is E..	1	40	N.
Variation of the compass is	11	17	East, because the true amplitude is to the right of the magnetic.

EXAMPLE IV.

Being at sea in latitude 43°36′N., and longitude 36°W. on February 13th, 1879, I observed the sun's centre setting W. 5°45′N.: required the variation of the compass.

	°	′	
By Table XIII. the sun's true amplitude is W...	18	46	S.
By compass the sun's magnetic amplitude is W.	5	45	N.
Variation of the compass is	24	31	West, because the true amplitude is to the left of the magnetic.

Deviation of the Compass.

So long as ships were built entirely of wood, the effect of iron on the compasses was not much heeded; but there is no doubt that many a fine vessel has, in times gone by, been lost through ignorance on this point. The introduction of iron in the construction of ships drew special attention to the subject, because compass courses that navigators had been accustomed to set, often took them wide of the direction they intended it should do.

I will explain what is meant by Deviation. I dare say you are well aware that if iron is brought close to a magnet, the two come together, as if with a slight force, showing attraction; you likewise probably know that the ends of the magnetic needle have different polarities, but so has a bar of soft iron when held vertically; and iron, when in any position, if near a compass, will affect it to a greater or less extent. Ships called composite (partly wood and partly iron), and such as are built wholly of iron, are strongly magnetic, and the effect on the compass is that it produces an *error* called Deviation; not that it is an error, strictly speaking, for the compass is only acting in obedience to a law of magnetism, but for the practical purposes of navigation it may be an error leading to serious consequences. Now, exactly as the magnetic needle, unaffected by local surroundings, points to the magnetic pole, forming an angle with the true meridian, so, in like manner, the same *needle, when under the influence of an iron ship's magnetism, forms an angle with the magnetic meridian;* and this is *called* the Deviation of the Compass.

I shall here speak only of the effect of Deviation on the compass, and the method of applying the error arising from it.

Unlike Variation, which, for any given place, is of the same amount, and in the same direction on every point of the compass, Deviation attains its greatest value on two nearly opposite points of the compass, and also, somewhere between these two points are two other points on which there is little or no Deviation; *nearly* half round the compass, from one point of no Deviation to the other, the *Deviation* is called *Easterly*, because the *needle* lies *to* the *right of* the *magnetic meridian;* between the same two points, on the other part of the compass, the *Deviation* is called *Westerly*, because the *needle* then lies *to* the *left of* the *magnetic meridian.* A glance at the following Deviation Card will illustrate this. N.E. by N. and S. by W. are the points of *no* Deviation; between them, round by eastward, the Deviation is Westerly, and it attains its greatest amount at S.E. by E.; from the same two points, but round by westward, the Deviation is Easterly, and attains its greatest amount at W. by S. Thus the Deviation differs, not only in amount but in name, for different directions of the ship's head. Also, bear in mind that every iron ship's compass has deviation peculiar to itself, the direction and amount of which for its various points must be ascertained by what is called *swinging ship for the errors of the compass.*

But our present purpose is to know how *to apply the Deviation*, and the *rule* is somewhat *similar to that* we use *when correcting for Variation* of the compass.

I must, however, in the first place introduce to your notice a term we have not as yet required, viz., *Correct* Magnetic. You can understand that before

deviation of the compass was recognised, a compass course or bearing and a magnetic course or bearing were considered to mean the same thing; but inasmuch as a compass course affected with deviation is also a magnetic course, since it is indicated by a magnetic needle, it became necessary to distinguish between the two; and hence *Correct* Magnetic Course or Bearing is used when we speak of direction as referred to the magnetic meridian, while Compass Course or Bearing is considered to be affected with both deviation *and* variation.

We will take examples from the following Deviation Card, in which col. 1 is supposed to represent the various *directions* of the ship's head by compass in its proper position, when, by observation, during swinging ship, the Deviations of col. 2 were ascertained; col. 3 gives the courses of col. 1 reduced to *Correct* Magnetic.

Deviation Card of the Standard Compass—Ship "NAVIGATION."

1 Ship's Head (course) by Standard Compass.	2 Deviation.	3 Correct Magnetic Course made good.	1 Ship's Head (course) by Standard Compass.	2 Deviation.	3 Correct Magnetic Course made good.
N.	° 6 E.	N. ° 6 E.	S.	° 6 W.	S. ° 6 E.
N. by E.	4¼ E.	N. 15½ E.	S. by W.	0½ W.	S. 10¾ W.
N.N.E.	2 E.	N. 24½ E.	S.S.W.	4½ E.	S. 27 W.
N.E. by N.	0½ W.	N. 33¼ E.	S.W. by S.	9½ E.	S. 43¼ W.
N.E.	3½ W.	N. 41½ E.	S.W.	13½ E.	S. 58½ W.
N.E. by E.	7 W.	N. 49¼ E.	S.W. by W.	16¼ E.	S. 72½ W.
E.N.E.	11 W.	N. 56½ E.	W.S.W.	17½ E.	S. 85 W.
E. by N.	14½ W.	N. 64¼ E.	W. by S.	18½ E.	N. 82¾ W.
E.	18 W.	N. 72 E.	W.	18 E.	N. 72 W.
E. by S.	20¾ W.	N. 80½ E.	W. by N.	17 E.	N. 61¾ W.
E.S.E.	22¼ W.	S. 89¾ E.	W.N.W.	15½ E.	N. 52 W.
S.E. by E.	23 W.	S. 79¼ E.	N.W. by W.	13¾ E.	N. 42½ W.
S.E.	22 W.	S. 67 E.	N.W.	12 E.	N. 33 W.
S.E. by S.	19½ W.	S. 53¼ E.	N.W. by N.	10½ E.	N. 23¼ W.
S.S.E.	15¾ W.	S. 38½ E.	N.N.W.	9¼ E.	N. 13½ W.
S. by E.	11¼ W.	S. 22½ E.	N. by W.	7½ E.	N. 3¾ W.

Rule—*To correct a Compass Course steered, take the Deviation on that point* —then—

DEVIATION *Westerly*, allow it to the *left* to get Correct Magnetic Course.
DEVIATION *Easterly*, allow it to the *right* to get Correct Magnetic Course.

Express the course in degrees, when applying the deviation.

Ex.—Compass course being S.E., *i.e.* S. 45° E., with Dev. 22° W., gives the Correct Magnetic course S. 67° E.

Ex.—Compass course being West, with Dev. 18° E., gives Correct Magnetic N. 72° W.

Ex.—Compass course being E.N.E., with Dev. 11° W., gives Correct Magnetic N. 56½° E.

Ex.—Compass course being N. by W. ½ W., with Dev. 8½° E. (half sum of 7½ and 9¼), gives Correct Magnetic N. 8¼° W.

You will see the whole of the Correct Magnetic courses in col. 3.

COMPASS BEARINGS (with deviation) require to be corrected, *not for the deviation on the bearing*, but for the Dev. on the direction of the ship's head (or course); thus:—Object's Bearing (by compass) S.W., with ship's head N.W., the Dev. on N.W. (by card above) being 12° E., the *Correct* Mag. Bearing will be S. 57° W.

When correcting for Deviation *and* Variation, and you take them separately, apply the Dev. first, and then the Var.

Rule—*To set a Correct Magnetic Course by the Deviation Table:*—

DEVIATION *Westerly*, allow it to the *right* of the Compass Course;
DEVIATION *Easterly*, allow it to the *left* of the Compass Course;

but, in each case, taking care to allow a *proper amount* of Deviation, for it rarely happens that the deviation on the required course is the amount to apply; from the following examples you will see what I mean:—

We wish to make good a *Correct* Magnetic Course E.N.E.; by the card, the deviation with the ship's head on E.N.E. is 11° W.; now 11° to right of E.N.E. gives E. by N (*nearly*); but if you steer E. by N., which has 14½° W. deviation on it, you will evidently make N. 64½° E. or N.E. by E. ¾ E. *correct* magnetic; so that to make E.N.E. correct Magnetic, you would have to steer a compass course a trifle *easterly* of E. ¾ N.

One of the most accurate methods of setting a Compass Course such that it shall give the *Correct* Magnetic Course required is to look down Col. 3, for the latter, and then take from Col. 1 the Compass Course that corresponds to it. Let us say that the required Cor. Mag. Course is East; now S. 89¾° E. (in Col. 3) is the nearest to it, therefore steer by Compass E.S.E. (from Col. 1). Or, the Cor. Mag. Course is W. by N.; now W. by N. is N. 78¾° W., which, in Col. 3 lies between N. 82¾° W. and N. 72° W.; midway between these is N. 77½° W.; therefore from Col. 1, steer by Compass a little *westward* of W. ½ S.

ERROR OF COMPASS,

AND HOW TO ALLOW IT ON COMPASS COURSE STEERED TO GET TRUE COURSE.

If you now have a clear idea of Deviation and Variation, you will understand that their *sum when* both have the *same name*, but their *difference when* they have *different names* is the ERROR OF THE COMPASS; for example—

Dev. 20° W. and Var. 21° W. (sum) gives Error of Compass 41° W.
Dev. 12° E. and Var. 18° E. (sum) gives Error of Compass 30° E.
Dev. 15° W. and Var. 9° E. (diff.) gives Error of Compass 6° W.
Dev. 8° W. and Var. 20° E. (diff.) gives Error of Compass 12° E.
Dev. 23° E. and Var. 17° W. (diff.) gives Error of Compass 6° E.
Dev. 9° E. and Var. 22° W. (diff.) gives Error of Compass 13° W.

and note, that in taking the difference, the remainder will be E. or W. according to the name of the greater quantity.

Now, the Error of the Compass, obtained as here shown, can undoubtedly be applied to a Compass Course steered, or to a Compass Bearing taken, with greater facility and with less chance of making a mistake, than if Dev. and Var. be applied separately, one after the other; and I must again remind you that the Dev. must be *that* on the compass course steered, while the Var. will be the same in amount and name on every course or bearing. The rule for its application is the usual one:—

Apply Error of Compass to the { *right* if *Easterly*. / *left* if *Westerly*.

GIVEN THE TRUE AMPLITUDE OF THE SUN AND ITS BEARING BY COMPASS TO FIND THE ERROR OF THE COMPASS AND DEVIATION.

1. *For the Error of the Compass.*—Under the True write the *observed* Amplitude, reckoned from the same point as the *true*, E. or W. as the case may be.

If both are N., or both S. take their difference ; if one is N. and the other S., take their sum ; the result in each case will be the Error of Compass.

Then, looking from the centre of the compass in the direction of the observed Amplitude—

Name Error E. if true, is to right of observed, Amplitude.

Name Error W. if true, is to left of observed, Amplitude.

2. *For the Deviation of the Compass.*—Under the Error of Compass write the Variation as given in question, then—

Error and Var., both E. or both W., take their difference.

Error and Var., one E. and the other W., take their sum.

The resulting Deviation will be of the *same name as the Error* of Compass ; *unless* the Error has been *subtracted* from the Variation, in which case the Deviation will be *E. when Error is W.*, but *W. when Error is E.*

Also, with Error 0, Deviation is of the same amount as the Variation, but of the opposite name ; with Variation 0, the Error is the Deviation.

ON THE HEELING ERROR OF IRON SHIPS.

Besides the Deviation that an iron ship has when on an even beam, it is subject to be altered in character and amount by the vessel's *heeling to starboard or port ;* and the *maximum* heeling errors are found *on northerly and southerly courses, none on east and west courses* (by compass). The amount of heeling error would, under ordinary circumstances, have to be found by heeling in the dock or river, or, when at sea, by observing the error for 10° of heel to starboard or port, when on or near North and South by compass. As for the character of this deviation (E. or W.) in the *northern hemisphere, in the majority of iron ships, the North end of the compass needle is drawn to windward* (or to the weather side), when the binnacles are above the upper deck, and the following results would arise from a disregard of this heeling error :—

"If the ship be kept steady on one compass course, she will be found to windward of her supposed position when on northerly courses, and to leeward on southerly courses. If she be steered steadily for a fixed point on the horizon, she will *appear* to fall off as she heels on northerly courses, and to come up on southerly courses." Therefore, as *a general rule*, it should be borne in mind "that in steering by compass and wishing to make a *straight course*, we must keep away, by compass, on either tack, as the ship heels, when on northerly courses ; and keep closer to the wind, by compass on either tack, when on southerly courses." Captain F. J. Evans, R.N., F.R.S.

METHOD OF KEEPING

A JOURNAL AT SEA.

A SEA JOURNAL is a book wherein is registered an exact and regular account of the various occurrences that happen on board a ship during her voyage; but more particularly those concerning the ship's way, in order that her situation may be known at any time required.

For this purpose there is kept in the steerage, or some other convenient part of every ship, a large board, painted black, called the LOG BOARD, which is usually divided into six columns: the first, on the left hand, contains the 24 hours from the noon of one day to the noon of the following; the second and third columns are for the knots and fathoms the ship runs in half a minute, or the miles and tenths in an hour*; the fourth column contains the courses steered by the compass; in the fifth the winds are entered; and in the sixth, the various remarks, such as the state of the weather, the sails set or taken in, the observations made for ascertaining the ship's place, the variation of the compass, and whatever else may be thought necessary. All these particulars are entered every day at noon into a book, divided into columns exactly like the log-board, and called the LOG BOOK. From this book the navigator makes the necessary deductions, relating to the ship's place, every day at noon; which operation is called doing a DAY'S WORK.

While the ship is in port, the remarks entered in the log-book are called HARBOUR WORK; and the account of the ship's way, &c. kept at sea, is termed SEA WORK.

In Harbour Work the day is estimated according to the civil reckoning, as on shore—that is, from midnight to midnight; but at sea, the days' works being made up at noon, are dated the same as the civil day, so that the days' works marked Monday, began on Sunday at noon, and ended on Monday at noon; hence the day by the ship's reckoning, which is called the nautical day, begins twelve hours before the civil day†: the first twelve hours, or those contained between noon and midnight, being marked P. M., signifying post meridiem, or afternoon, and the other twelve hours, A. M., signifying ante meridiem, or before noon‡.

* In the Royal Navy, and on board ships that undertake an East India or other long voyage, the log is hove every hour; but in short trading vessels only once every two hours. This last circumstance makes no difference in the computation, excepting that the knots and fathoms run on every course by the log, must be doubled, to give the whole distance.

† In compliance with an order from the Admiralty, the Navy Logs are dated at midnight, in order to correspond with the civil mode of reckoning time.

‡ As the astronomical day begins at noon of the civil day, which is the end of the nautical day, the declination of the sun, used in determining the latitude by a meridian altitude, is taken out from the Tables, or Nautical Almanac, for the noon of the civil day.

When a ship is bound from one place to another that lies so far from her that she is obliged to leave the land, at the time of losing sight of it, the bearing of some place is to be observed, whose latitude and longitude are known; which, together with the estimated distance of the ship from the land, is to be set down on the log-board. This is called *taking a departure*

TO CORRECT THE COURSES STEERED BY COMPASS.

The variation of the compass, which is usually found by observation, as already explained, must be applied to all courses steered, and on all bearings taken by the compass, in the following manner. Suppose yourself placed at the centre of the compass, and looking directly forward to the point you are to allow the variation from; then, if the variation be easterly, allow it to the right hand of the course steered, or bearing taken by compass; but if westerly, to the left hand; by which you will obtain the true course.

For example, suppose the course steered by compass is N. E. by N., and the variation is 1 point westerly; now, 1 point to the left hand of N. E. by N. is N. N. E., which is the true course required. Again, suppose I set a Cape, and find it bear from me S. W. by compass, the variation being $1\frac{1}{2}$ point easterly: here $1\frac{1}{2}$ point allowed to the right hand of S. W. will give S. W. by W. $\frac{1}{2}$ W., the true bearing of the land.

The courses must likewise be corrected for leeway, the nature of which may be thus explained. When a ship is close hauled, and the wind blowing fresh, that part of the wind which acts upon the hull and rigging, together with a considerable part of the force exerted on the sails, tends to drive her immediately from the direction of the wind, or, as it is termed, to leeward. But since the bow of a ship exposes less surface to the water than the side, the resistance will be less in the first case than in the second: the velocity, therefore, in the direction of her head, will, in most cases, be greater than the velocity in the direction of her side, and the ship's course will be between the two directions. Now the angle contained between the line of the ship's apparent course, and the line she really describes through the water, is termed her LEEWAY.

The quantity of leeway to be allowed will depend upon a variety of circumstances; as the mould or trim of the ship; the quantity of sail she carries; her velocity through the water, &c.: hence no general rules can be laid down with accuracy that will determine the quantity of leeway at all times. The following have, however, been usually given by most writers on Navigation.

1. When a ship is close hauled, has all her sails set, the water smooth, with a light breeze of wind, she is then supposed to make little or no leeway.
2. When the top-gallant sails are handed, allow one point;
3. When under double-reefed topsails, one point and a half;
4. When under close-reefed top-sails, two points;

5. When the top-sails are handed, three points and a half;
6. When the fore-course is handed, four points;
7. When under the main-sail only, five points;
8. When under the balanced mizen, or mizen stay-sail, six points;
9. When under bare poles, seven points.

As these allowances depend entirely on the quantity of sail set, and the heave of the sea, without having any regard to the form of the ship, or nature of the cargo she may have on board, it is evident they can only be considered as probable conjectures, and may indeed serve to work up the day's work of a journal that has been neglected. But since the computation of a ship's way depends much upon the accuracy of this allowance, it should always be the duty of the officer of the watch carefully to observe the lee-way, and either allow it upon the courses steered, before they are put down on the log-board, or else set it down in a column reserved for that purpose.

The leeway that a ship makes may be easily estimated thus: draw a small semicircle on the taffrail, with its diameter at right angles to the ship's keel, and divide its circumference into points and quarters; then observe the angle contained between the semidiameter which points right aft, and that which points in the direction of the wake, and it will be the leeway required. But the most accurate method of determining the leeway is to have a semicircle drawn on the taffrail, as before described, with a low crutch or swivel in its centre. Then, after heaving the log, the line is to be slipped into the crutch just before it is drawn in, and the points and quarters contained between the direction of the log-line and the fore and aft line of the semicircle, will be the quantity of leeway.

The leeway being determined, is to be allowed *from the wind*, that is, to the right hand of the course steered, when the larboard tacks are aboard, and to the left hand when the starboard tacks are aboard*, supposing yourself looking from the centre of the compass towards that point the ship's head is directed to. For example: suppose a ship sails S. W. by S. by compass, with her starboard tacks aboard, and she makes one point leeway; her course corrected for leeway will be S. S. W., being one point to the left of her course by compass. Again, if a ship close-hauled sails N. E. when the wind is N. N. W., and makes 1½ point lee-way, her true course will be N. E. by E. ½ E.; because, having her larboard tacks aboard, 1½ point is to be counted to the right hand of the course by compass.

The Examples in the following Table, where the courses steered, with the lee-way and variation to be allowed on each, are given from thence

* When a ship is close hauled, certain ropes, called *tacks*, which are fastened to the lower corners of the main and foresails, are hauled forward on the weather side, or that next the wind, in which case those tacks are said to be aboard. When a ship is close hauled, that is, when she sails as near the wind as she will lay, with the wind on the right hand, she has her starboard tacks aboard, and is said to sail on the starboard tack. But if the wind be on the left hand in the same manner, she has her larboard tacks aboard, and is said to sail on the larboard tack.

to find the true courses, will serve to exercise the learner in the foregoing Rules.

GIVEN.				TO FIND.
Courses steered.	Winds.	Leeway.	Variation.	Courses corrected.
E. N. E.	N. W.		1½ W.	N. E. ½ E.
W. by S.	N. W by N.	1		W. S. W.
N. W. by N.	N. E. by N.	1½	2 W.	W. N. W. ½ W.
South.	E. S. E.	½	1¼ E.	S. by W. ¾ W.
N. W.	W. S. W.	2	1 W.	N. W. by N.
S. S. W.	S. E.	1¼	1¼ W.	S. S. W.
E. by N.	N. by E.	2½	0¾ E.	S. E. by E. ¾ E.
West.	N. N. W.	¾	1 E.	W. ¼ N.

In hard blowing weather, with a contrary wind and a high sea, it is impossible to gain any advantage by sailing; in such cases, therefore, the object is to avoid, as much as possible, being driven back. With this intention it is usual to lie-to under no more sail than is sufficient to prevent the violent rolling which the vessel would otherwise acquire, to the endangering the masts and rigging. When a ship is brought-to, the tiller is put gradually over to leeward, which brings her head round to the wind. The wind then having very little power on the sails, the ship loses her way through the water, which ceasing to act upon the rudder, her head falls off from the wind, the sail which she has set fills, and gives her fresh way through the water; which acting on the rudder, brings her head again to the wind. Thus, the ship has a kind of vibratory motion, coming up to the wind, and falling off from it alternately.

When a ship is lying-to, observe the points on which she comes up and falls off, and take the middle point for the apparent course; on which allow the variation and lee-way, and you will have the true direction of the drift. For example. suppose a ship lying-to under a main-sail, with her starboard tacks aboard, comes up E. by S., and falls off N. E. by E., there being one point westerly variation, and she makes five points lee-way, what course does she make good? The middle point between E. by S. and N. E. by E. is E. by N., from which, allowing five points to the left hand, because the starboard tacks are aboard, gives the course, corrected for lee-way, N. N. E.; from which, allowing one point to the left hand, because the variation is westerly, will give the true course N. by E.

In sailing along a coast, in a tide or current, particular care should be taken to observe its setting, which, with the variation allowed, is to be entered in the Traverse Table as a course, and its drift as a distance; the same is to be observed for the heave or swell of the sea.

On leaving the land, the opposite point to its bearing from the ship, with the variation allowed, and the estimated distance from it, are to be set down in the Traverse Table as a course and distance.

The computation made from the several courses, corrected as above, and their corresponding distances, is called a DAY'S WORK; and the ship's place, as deduced therefrom, is called her latitude and longitude by ACCOUNT, or DEAD RECKONING.

If the course and distance made good by a ship, as estimated from the compass and the log, could be accurately ascertained, nothing more would be necessary in determining a ship's place at any time during her voyage; for the course and distance being known, the difference of latitude and longitude, and hence the latitude and longitude she is in, may be readily found by any of the methods shewn in the various Sailings; but on account of the many accidents that attend a ship's way, such as swelling of the sea; different rates of sailing between the times of heaving the log; want of care at the helm; unknown currents; sudden squalls; improper allowances for variation and leeway; the inaccuracy of the glass and log-line, &c.; the latitude of the ship, as deduced from the reckoning, will frequently differ considerably from the latitude by observation, and hence the difference of longitude and longitude in by account, will be likewise erroneous. Now if, after all proper allowances are carefully made, the latitude by account and observed latitude should disagree, it is then recommended by some authors to correct for supposed errors in the courses and distances. Thus, if the course be near the meridian, the error is supposed to arise from the distance, because the error in the course must be sensible, to make any considerable error in the difference of latitude; if the course be nearly east or west, then the error is supposed to result from the course, as an error in the distance must be very great to make a considerable one in the latitude; but if the course be near 4 points, then the error in the latitude is attributed partly to the course and partly to the distance. The Rules founded upon these suppositions, it must be confessed, are, in general, little better than guesswork: however, as they may be sometimes useful, we think it proper to introduce them here, with examples worked by inspection.

RULES FOR CORRECTING THE DEAD RECKONING.

CASE I.

When the Error is supposed to arise from the Distance.

RULE. With the course found by the difference of latitude and departure by account, and the meridional difference of latitude between the observations, find the difference of longitude.

EXAMPLE.

Yesterday at noon we were in latitude 39° 18′ N., and by observation this day at noon we are in latitude 37° 48′ N., having made by our reckoning 107 miles of southing, and 64 of westing: required the true difference of longitude.

The difference of latitude 107 and departure 64 give the course 2¾ points; then with the same course and the meridional difference of latitude between the two observations 115, the difference of longitude is found to be 69 miles.

CASE II.

When the Error is supposed to arise from the Course.

Rule. With the difference of latitude and departure by account find a distance; with this distance and the difference of latitude by observation find a course; then with this course and the meridional difference of latitude between the two observations find the true difference of longitude.

Or, with the distance by account and difference of latitude by observation find a corresponding departure; with which and the co-middle latitude between the observations find the true difference of longitude.

EXAMPLE.

Yesterday at noon we were in latitude 38° 52′ N.; to-day at noon we are in latitude 40° 18′ N., and by account we have made 68 miles of northing, and 212 of westing: required the true difference of longitude.

With the difference of latitude 68 and the departure 212, the distance is found to be 223; the distance 223, and the difference of latitude by observation 86, give the true course 67°; this course and the meridional difference of latitude by observation 111, give the true difference of longitude 261 miles.

Or, the distance by account 223, and the difference of latitude by observation 86, give the true departure 205; the co-middle latitude between the observations 50° 25′, and the departure 205, give the correct difference of longitude 266 miles.

CASE III.

When the Error is supposed to arise both from the Course and Distance.

Rule. With the difference of latitude and departure by account find a distance; with that distance and the difference of latitude by observation find a corresponding departure; which add to the departure by account, and take half their sum for the true departure. With the true departure and the difference of latitude by observation find the true course; with which and the meridional difference of latitude by observation find the true difference of longitude

EXAMPLE.

Yesterday at noon we were in latitude by observation 52° 40′ N., and are this day at noon in latitude 54° 22′ N., having made by account 84 miles of northing, and 76 of westing: required the true difference of longitude.

The difference of latitude 84 and departure 76 give the distance 113; with this distance and the difference of latitude by observation 102, the corresponding departure is 47.8, which added to 76, the departure by account, is equal to 123.8, half of which is 61.9, the true departure; then with the true departure 61.9 and the difference of latitude by observation 102, the true course is found to be 31°: this course and the meridional difference of latitude between the two observations 171, give the true difference of longitude 103 miles.

To correct for several Days.

Enter in a Traverse Table the difference of latitude and departure made good each day since last observation, including those for the day you correct on; whence you will have the whole difference of latitude and departure since last observation, with which find the course since last observation, and correct accordingly by one of the preceding cases.

Notwithstanding the above corrections be applied with the greatest care to the ship's reckoning, it is frequently found, on making the land after a long voyage, that the longitude by dead reckoning differs several degrees from the truth: a good navigator will therefore lose no opportunity of ascertaining the longitude by observation; and when this is done, the account of longitude is to be carried forward from the last observation in the same manner as that of the latitude. A separate account is usually kept of the longitude by dead reckoning, and of that by observations.

GENERAL RULES FOR WORKING A DAY'S WORK.

1. Enter in a Traverse Table the several courses steered, corrected for variation and leeway; and opposite each course place the whole distance run as it appears by the log on summing up the knots and fathoms while the ship is on that course. Find the difference of latitude and departure answering to each course and distance, and set them down in their respective columns; then the difference between the sums of the northings and southings will be the difference of latitude made good, of the same name with the greater; and the difference between the sums of the eastings and westings will be the departure made good, of the same name with the greater quantity.

2. Seek in the Traverse Table until the above difference of latitude and departure are found together in their respective columns: opposite to these will be the distance made good; and at the top or bottom of the page, according as the departure is less or greater than the difference of latitude, will be found the course.

3. If the latitude from which the ship's departure is taken, or yesterday's latitude, be of the same name with the difference of latitude, add them together; if not, take their difference; the sum or remainder will be the present latitude, at noon, by account, of the same name with the greater.

4. Find the complement of the middle latitude between yesterday's and to-day's latitude, which take as a course in the Traverse Table, and seek for the departure in its column; then will the distance corresponding to these be the difference of longitude, of the same name as the departure.

Or, seek for the course made good, and for the meridional difference of latitude in a lat. column; then will the corresponding departure give the difference of longitude as before.

5. If the longitude of yesterday be of the same name with the difference of longitude, add them together; if not, take their difference; the sum or remainder will be the longitude in, of the same name with the greater.

6 To find the bearing and distance of the intended port, or any other place, from the ship, find the complement of the middle latitude between the ship and the proposed place; which seek in the Traverse Table as a course: in that page where it is found, look for the difference of longitude in a distance column, opposite to which will be the departure in its proper column; with this departure and the difference of latitude, find the true course or bearing, and the distance as before.

Or, look for the meridional difference of latitude and difference of longitude, till they are found opposite each other in the lat. and dep. columns, and they will give the true course; this course and the proper difference of latitude in the lat. column, will give the distance in its proper column.

If the magnetic course or bearing be required, the variation must be allowed on the true bearing; to the right-hand, if the variation be westerly, or to the left-hand, if easterly.

There are various methods of keeping a Sea Journal, with regard to what deserves to be recorded, according to the sentiments of different persons. Some approve of a journal including the log-book, each day's work at some length, and such occurrences as seem of most importance; while others prefer a short abstract of this long journal, containing little more than the course and distance run, the latitude and longitude in, and sometimes the bearing and distance to the intended port, for each day. There are likewise forms peculiar to the particular service to which a ship belongs, as in the Royal Navy and East India Merchant Service.

We shall now proceed to exemplify the above Rules, in a Journal from London to Madeira, kept in the form generally used in merchant ships, and containing most of the occurrences that happen to a ship in a common voyage.

NOTE. In the following Journal, the log is supposed to be hove every hour, and the knot divided into eight fathoms of six feet each.

JOURNAL

OF A

VOYAGE FROM ENGLAND TO MADEIRA,

IN THE SHIP

BRITANNIA,

J. W. N., COMMANDER,

KEPT BY C. W., MATE.

1870.

Date.	Winds.	Remarks on Board the Ship BRITANNIA, 1870.
Tuesday. June 7.	S. S. W. S. W.	Moderate and clear. At 6h. A. M. the Pilot came on board. At 8h. A. M. cast loose from the sheer hulk at Deptford, and made sail down the river. At 2h. P.M. anchored in Long Reach, and moored ship, with a cable each way.
Wednesday, June 8.	W. by S.	Fresh gales with showers. P. M. received on board the carpenter's and boatswain's stores.
Thursday. June 9.	S. S. W. to N. N. W.	Light airs and fine weather. At 6h. A. M. unmoored, and hove short on the best bower. At noon weighed with a light breeze from the westward. At 3h. P. M. came to with the best bower off Gravesend.
Friday, June 10.	W. N. W.	Moderate weather and fair. At daylight weighed, and made sail. At 1h. P. M. anchored with the best bower at the Nore, in 9 fathoms. At 5h. P.M. weighed, and sailed through the Queen's Channel. At half-past 8 P. M. came to with the best bower at the back of Margate Sand.
Saturday, June 11.	N. by E. N.	Moderate wind and cloudy, with showers. At 6h. A. M. weighed, and made sail. At 8h. A. M. ran through the Gull Stream, and came to an anchor in the Downs, in 7 fathoms, about 1 mile off shore, Deal Castle bearing W. N. W., the South Foreland S. W., and the North Foreland N. N. E. P. M. the Pilot left the ship.
Sunday, June 12.	N. N. E.	A pleasant breeze, with fair weather throughout. A. M. employed filling up the water, stowing the booms and boats, and getting all clear for sea. At 10h. A. M. weighed, and made sail. At noon the South Foreland lights bore N. N. W., distant about 4 miles. This log contains 12 hours, and ends at noon, to commence the sea-log.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks Monday, June 13, 1870.
1	1	2	W. S. W. ½ W.	N. N. E.		Light winds and clear.
2	1	4				People employed variously under the Boat-swain.
3	2					
4	3					Carpenter making a spare top-gallant yard.
5	3	2				
6	3	4				
7	3					
8	3	4				
9	2	4	W. ½ N.			
10	2	4				Dungeness Light North.
11	3					
12	3					
1	3	4				
2	4					
3	4	2				
4	4	2				Beachy Head revolving Light W. N. W.
5	4	4				
6	5					In 1st reef of the topsails.
7	5	2				
8	6	2				
9	7		W. N. W. ½ W.	N. E.		Brisk gales.
10	7	4				
11	8					
12	8	4				Bembridge Point N. N. W. ¼ W.

Course.	Dist.	Diff. lat.	Dep.	Latitude. Acc.	Latitude. Obs.	Diff. long.	Longitude. Acc.	Longitude. Obs.	Bearing and Distance at noon.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Tuesday, June 14, 1870.
1	8		W. N. W.	N. E. by N.		Fresh breezes and fair throughout.
2	8					At ½ past 1 abreast of St. Catherine's Point, off shore about 3 miles.
3	8					
4	7	6				
5	7	2				St. Alban's Head N. W. ¼ W.
6	7		West.			
7	7					
8	6	4				
9	6					Portland Light N. N. W.
10	6					
11	6					
12	6			E. N. E.		
1	5					
2	5					
3	5	4				Out reefs of the topsails.
4	5					
5	5					
6	5					
7	6		N. W. by W.			
8	6	2				Two strange sail in sight on the weather-bow.
9	6					
10	6					
11	5		W. by N.			
12	5					At noon mustered the ship's company.

Course.	Dist.	Diff. lat.	Dep.	Latitude. Acc.	Latitude. Obs.	Diff. long.	Longitude. Acc.	Longitude. Obs.	Bearing and distance at noon.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Wednesday, June 15, 1870.
1	5		W. by N.	E. N. E.		A brisk wind and clear.
2	5	4				
3	6					
4	6					
5	5	2				
6	4					At 6h. P. M. the Lizard bore N. E. by N.
7	4					distant 3 leagues; from which I take my
8	3	4				departure.
9	3	6				
10	3					
11	3			N. by W.		
12	3	6				
1	4					
2	4	4	S. W. ½ W.			
3	5					
4	5					A. M. stowed the anchors, unbent the cables,
5	5					and coiled them down in the tier.
6	4	4				
7	4	6				
8	5					
9	5					
10	6					At noon sounded. Ground 76 fathoms; sand,
11	5					shells, and hakes's teeth.
12	5	2				Variation 2¼ points West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. 37° W.	81′	65′ S.	49′ W.	48° 53′		76′ W.	6° 27′		

As the Lizard is the last point of land in sight, the ship's departure is taken from thence, supposing it to be in latitude 49° 58′ N. and longitude 5° 11′ W.; now, as the bearing of the Lizard from the ship was N. E by N., the bearing of the ship from the Lizard was S. W. by S.; but as this is the bearing by compass, the variation 2¼ points W. is to be allowed to the left hand, which will give the true bearing S. ¾ W.; this is to be entered in the Traverse Table as a course, and 3 leagues, or 9 miles, the supposed distance of the Lizard from the ship, as a distance run. The courses, corrected for variation, and the distance run by the log, after 6h. P. M., are also to be set down in the Traverse Table, as follows:—

Courses.	Dist.	N.	S.	E.	W.
S. ¾ W.	9		8.9		1.3
W. S. W. ¾ W.	25		6.1		24.3
S. S. W. ¼ W.	55		49.7		23.5
	Diff. lat.		64.7	Dep.	49.1

The diff. of lat. 64′.7 S. and departure 49′.1 W. give the course made good from the Lizard S. 37° W., and the distance 81 miles.

Lat. of the Lizard	49°	58′	N.
Diff. of lat. 65m. or	1	5	S.
Latitude in by account ...	48	53	N.
Sum of latitudes	98	51	
Middle latitude	49	25	
Comp. of mid. latitude ...	40	35	

The comp. of mid. lat. 40° 35′ as a course, and the departure 49′.1 in a departure column, give the diff. of longitude in a distance column 76 miles, or ..... 1° 16′ W.

Longitude of the Lizard.....	5	11	W.
Longitude in by account.....	6	27	W.

The course and distance made good, the whole diff. of lat. and departure, the lat. and long. in by account, &c. are now to be set down in their respective columns, as above.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Thursday, June 16, 1870.
1	5	4	S. W.	N. by W.		A moderate breeze, with fair weather for the most part.
2	5					
3	5					
4	4	4		N. W. by N.		
5	4					
6	4		W. by S.		½	
7	4					
8	3	6				In 1st reef of the topsails.
9	3	2				
10	3					Tacked ship.
11	3		N. W. by W.	S. W. by W.	1	
12	3					
1	2					
2	2					
3	3					
4	4					Out reefs of the topsails.
5	4					Tacked.
6	4	4	S. by E.		½	
7	4	4				
8	5					
9	5					Tacked.
10	5		West.	S. S. W.	¼	Spoke a brig, bound to Newfoundland.
11	5					
12	5					Variation 2¼ points West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. 42° W.	64′	47′ S.	42′ W.	48° 6′		64′ W.	7° 31′		Cape Finisterre. S. 13½° W., 319m.

The courses corrected for variation and leeway, with their corresponding distances, will be as in the following Traverse Table.

Courses.	Dist	N.	S.	E.	W.
S. by W. ¾ W.	24		22.6		8.1
S. W. ½ W.	18		12.1		13.3
W. N. W. ½ W.	21	7.1			19.8
S. E. ½ S.	19		14.1	12.8	
W. S. W.	15		5.7		13.9
		7.1	54.5	12.8	55.1
			7.1		12.8
	Diff. lat.		47.4	Dep.	42.3

With the diff. of latitude 47′. 4 S. and the dep. 42′. 3 W., the course is found to be S. 42° W., and the distance 64 miles.

Yesterday's latitude	48° 53′	N.
Diff. of latitude	47	S.
Latitude in by account	48 6	N.
Sum of latitudes	96 59	
Middle latitude	48 29	
Comp. of mid. latitude	41 31	

With the comp. of mid. latitude 41° 31′, and departure 42′. 3, the diff. of longitude is found to be 64 miles, or ..... 1° 4′ W.

Yesterday's longitude ..... 6 27 W.

Longitude in by account ..... 7 31 W.

To find the Bearing and Distance of Cape Finisterre.

Lat. of ship ..... 48° 6′ N. ..... Mer. Parts... 3301 Longitude of ship ... 7° 31′ W.
Lat. of C. Finisterre 42 56 N. ..... Mer. Parts... 2858 Long. of C. Finisterre 9 17 W.

Diff. of latitude..... 5 10=310′ Mer. diff. lat. 443 Diff. of longitude..... 1 46=106′

The mer. diff. lat. 443′, and diff. of long. 106′, give the course S. 13½° W.; which course, and *the proper diff. of latitude* 310′, give the distance 319 miles.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks. Friday, June 17, 1870.
1	5		West.	S. S. W.	¼	The first part a fresh breeze and cloudy; the middle and latter less wind, with a heavy swell from the S. W., for which I allow 12 miles.
2	5					
3	4	6				
4	4	4				
5	4	4				
6	4	2				People employed pointing a new main-sail, and drawing and knotting yarns.
7	4					
8	4					
9	4					
10	4					
11	3	6			½	Saw a stranger, under all sail, standing to the N. Eastward.
12	3	6				
1	3	4				
2	3					
3	3					
4	3					
5	2		W. S. W.	South.	1	
6	2					
7	2	2				
8	2	4				Pumped ship at 14 inches water.
9	2	6				
10	2	4				Lat. obs. by mer. alt. 47° 43′ N.
11	3					
12	3					Variation 2 points West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. 74° W.	75′	21′ S.	72′ W.	47°45′	47°43′	108′ W.	9° 19′		Cape Finisterre, South, 287m.

This day the swell setting from the S. W. is supposed to drive the ship 12 miles to the N. E., which, corrected for variation, is N. N. E.; these are therefore set down as the last course and distance in the Traverse Table.

Courses.	Dist.	N.	S.	E.	W.
W. S. W. ½ W.	44		14.8		41.4
W. S. W. ½ W.	20		5.8		19.1
S. W. by W.	20		11.1		16.6
N. N. E.	12	11.1		4.6	
		11.1	31.7	4.6	77.1
			11.1		4.6
	Diff. lat.		20.6	Dep.	72.5

With the diff. of lat. 20′. 6, and the departure 72′. 5, the course is S. 74° W., and the distance 75 miles.

Yesterday's latitude	48° 6′	N.
Diff. of latitude	21	S.
Latitude in by acc.....	47 45	N.
Sum of latitudes.....	95 51	
Middle latitude	47 55	
Comp. of mid. latitude ...	42 5	

The comp. of mid. latitude 42° 5′, and the departure 72′. 5, give the difference of longitude 108 miles, or ..... 1° 48′ W.

Yesterday's longitude..... 7 31 W.

Longitude in ..... 9 19 W.

To find the Bearing and Distance of Cape Finisterre.

Latitude of ship ...	47° 43′ N.	Mer. Parts...	3266	Longitude of ship.....	9° 19′ W
Lat. of C. Finisterre	42 56 N.	Mer. Parts...	2858	Long. of C. Finisterre	9 17 W.
Diff. of latitude.....	4 47 = 287	Mer. diff. lat.	408	Diff. of longitude.....	2

Hence the true course is due South nearly, and the distance 287 miles.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Saturday, June 18, 1870.
1	3		West.	S. S. W.	1	
2	3					Mostly fresh breezes throughout, with cloudy weather, and rain at times.
3	3	2				
4	3	2				In 1st reef of the topsails.
5	4					
6	4					
7	4	4				Tacked ship.
8	5		S. S. E.	S. W.	½	
9	5					
10	5					
11	5		S. by E.	S. W. by W.		
12	5	2				At 12h. the foot rope of the mizen topsail gave way; unbent it, and bent another.
1	5	4				
2	5	2				
3	5					
4	5	4	S. by W.	W. by S.		
5	5	6				
6	6					
7	6					
8	6	4				
9	7					
10	7	2				Lat. obs. by double alts. 46° 3′ N.
11	6					
12	6					Variation 2 points West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. 7° E.	92′	92′ S.	12′ E.	46°11′	46° 3′	18′ E.	9° 1′		Cape Finisterre, S. ½ W., 187 m.

Courses.	Dist.	N.	S.	E.	W.
W. by S.	25		4.9		24.5
S. E. ½ E.	15		10.1	11.1	
S. E. by S.	26		21.6	14.4	
S. by E.	56		54.9	10.9	
	Diff. lat.		91.5	36.4	24.5
				24.5	
			Dep.	11.9	

The diff of latitude 91′.5, and dep. 11′.9, give the course S. 7° E., and the distance 92 miles.

Yesterday's lat. by obs.....	47°	43′ N.
Diff. of lat. 92m., or.....	1	32 S.
Lat. in by account	46	11 N.

The latitude by account differing considerably from the latitude by observation, and as the course is near the meridian, I conclude that the error in the reckoning arises from the distance, and therefore find the difference of longitude by Case I., page 41.

Yest. lat. by obs..... 47° 43′ N....Mer. Pts. 3266
Lat. to-day by obs... 46 3 N....Mer. Pts. 3120

Mer. diff. lat. by observation 146

The course 7°, and the mer. diff. lat. by obs. 146′, give the diff. of long. 0° 18′ E.

Longitude yesterday	9	19 W.
Longitude in by acc.	9	1 W.

To find the Bearing and Distance of Cape Finisterre.

Latitude of ship ... 46° 3′ N. .....Mer. Parts... 3120
Lat. of C. Finisterre 42 56 N. .....Mer. Parts... 2858

Diff. of latitude..... 3 7=187 Mer. diff. lat. 262

Longitude of ship ... 9° 1′ W.
Long. of C. Finisterre 9 17 W.

Diff. of longitude..... 0 16

Hence the true course is about S. ½ W., or the magnetic course S. S. W. ½ W., and the *distance 187 miles.*

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Sunday, June 19, 1870.
1	6		S. by W.	W. by S.		Fresh breezes throughout, with fair weather and smooth water.
2	7					
3	7					People employed under the Boatswain.—
4	6	6				Carpenter making a top-mast studding-sail boom.
5	6					
6	6		S. by E.	S. W. by W.		Sail-maker making a quarter-deck awning.
7	6					
8	6					
9	6					
10	6	4				Tacked.
11	6	6	West.	S. S. W.		
12	7					
1	7					
2	7					
3	7	4				
4	8					
5	8					
6	8					
7	8					Passed by a ship under American colours,
8	8					standing to the Eastward.
9	7	2				
10	7	4				Lat. obs. by mer. alt. 44° 19′ N.
11	7					
12	7					Variation 2 points West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. 33° W.	124′	104′ S.	67′.9 W.	44° 26′	44° 19′	96′ W.	10° 37′		Cape Finisterre. S. E. by S., 101m.

Courses.	Dist.	N.	S.	E.	W.
S. by E.	33		32.4	6.4	
S. E. by S.	30		24.9	16.7	
W. S. W.	104		39.8		96.1
	Diff. lat.		97.1	23.1	96.1
					23.1
				Dep.	73.0

The diff. of lat. 97′.1, and the dep. 73′.0, give the course S. 37° W., and dist. 122 miles.

Yesterday's lat. by obs..... 46° 3′ N.
Diff. of lat. 97 miles, or ..... 1 37 S.

Latitude in by acc. ..... 44 26 N.

Yesterday's lat. by obs. 46° 3′ N. Mer. Pts. 3120
Latitude in by obs. ... 44 19 N. Mer. Pts. 2972

Diff. lat. by obs. 104′ = 1 44 Mer. diff. lat. 148

The latitude by observation not agreeing with the latitude by account, I correct the dead reckoning by Case III., page 42; because, the course being nearly 4 points, it is presumed that the course and distance are both erroneous.

The distance by account 122′, and the diff. of lat. by observation 104′, give in a departure column 62′.8; which added to the departure by account 73′, half their sum 67′.9 is the true departure.

The departure 67′.9, and diff. of latitude by obs. 104′, give the true course S. 33° W., and distance 124 miles. The course 33°, and the mer. diff. of latitude between the observations 148′, give the true diff. of longitude 96 miles, or ..... 1° 36′ W.

Longitude yesterday ..... 9 1 W.

Longitude in by account..... 10 37 W.

To find the Bearing and Distance of Cape Finisterre.

Latitude of ship ... 44° 19′ N..... Mer. Parts... 2972 Longitude of ship ... 10° 37′ W.
Lat. of C. Finisterre 42 56 N..... Mer. Parts... 2858 Long. of C. Finisterre 9 17 W.

Diff. of latitude..... 1 23 = 83′ Mer. diff. lat. 114 Diff. of longitude..... 1 20 = 80′

Hence the true bearing of Cape Finisterre is S. E. by S., or S. by E. by compass, and the distance 101 miles.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Monday, June 20, 1870.
1	6	6	W. by S.	S. by W.		Strong breezes, with rain, attended with hard
2	6	2				squalls, thunder, and lightning.
3	6					In first reef of the topsails.
4	5					
5	5					Tacked.
6	5		S. E. by S.	S. W. by S.	1	Squally. In top-gallant sails.
7	5					In second reef of the topsails.
8	4					Down top-gallant yards.
9	4		S. S. E.	S. W.	1	
10	4					Hard squalls. Handed the main-sail and
11	3	6				mizen top-sail.
12	3					Close reefed, and handed the fore and main
1	–		up S. by E.		5	top-sails, and brought the ship to under a
2	–		off S.E. by E.			fore sail, mizen, and main stay-sail.
3	–		up W. by S.	Variable.		Wore ship.
4	–		off N W b. W		5	
5	3		W. by N.	S.W. by S.	1½	At daylight more moderate. Set the top-sails
6	3					double reefed, and the main-sail. Up top-
7	4					gallant yards.
8	4	6	West.	S. S. W.	1½	Fair weather. Out all reefs of the top-sails.
9	4	2				Set the top-gallant sails.
10	4					
11	4					
12	4					Variation 2 points West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. W.	41′	29′ S.	29′ W.	43° 50′		40′ W.	11° 17′		Cape Finisterre, S. E. by E. ½ E. 102m.

It appears by the log of this day, that the ship has been lying-to from midnight to 4 in the morning; therefore the middle points between those the ship comes up to and falls off to, corrected for variation and leeway, as directed in page 40, together with the drift, which is here assumed at 1 knot per hour, are inserted in the Traverse Table, as the fourth and fifth course and distance.

Courses.	Dist.	N.	S.	E.	W.
S. W. by W.	29		16.1		24.1
E. S. E.	14		5.4	12.9	
S. E. by E.	15		8.3	12.5	
E. N. E.	2	0.8		1.8	
N. W.	2	1.4			1.4
W. ½ N.	10	1.0			10.0
W. ½ S.	21		2.1		20.9
		3.2	31.9	27.2	56.4
			3.2		27.2
		Diff. lat.	28.7	Dep.	29.2

The diff. of lat. 28′.7, and dep. 29′.2, give the course S. 45½° W., and distance 41 miles.

Yesterday's lat...	44° 19′ N.	...Mer. Parts.	2972
Diff. lat.....	29 S.		
Latitude in	43 50 N.	...Mer. Parts.	2932
Sum of latitudes.	88 9		
Mid. latitude.....	44 4	Mer. diff. lat.	40
Co. mid. latitude.	45 56		

The comp. of mid. lat. 45° 56′, and dep. 29′.2, or the course 45½°, and the mer. diff. of lat. 40, give the diff. of long..... 0° 40′ W.

Yesterday's longitude ... 10 37 W.

Longitude in by account. 11 17 W.

To find the Bearing and Distance of Cape Finisterre.

Latitude of ship ...	43° 50′ N.	... Mer. Parts...	2932	Longitude of ship ...	11° 17′ W.
Lat. of C. Finisterre	42 56 N.	... Mer. Parts...	2858	Long. of C. Finisterre	9 17 W.
Diff. of latitude.....	54	Mer. diff. lat.	74	Diff. of longitude.....	2 0=120

Hence the true bearing of Cape Finisterre is S. E. by E. ½ E., or S. E. by S. ½ E. by compass, *and the distance 102 miles*

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Tuesday, June 21, 1870.
1	4		West.	S. S. W.	1½	Fair weather throughout
2	4					
3	4					
4	4					
5	4					
6	4	6	W. by S.	S. by W.	1	
7	5					
8	5	2				
9	5		S. W. by W.	S. by E.	½	
10	5					
11	5					
12	5					
1	5					
2	5					
3	5	4				
4	5	6	S. W.	S. E. by S.		
5	5					
6	5					
7	4	4				
8	4					
9	4	2				At noon pumped ship at 10 inches water.
10	4					
11	4	4				
12	4					Variation per amplitude 21° West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and distance at noon.
S. 46° W.	102′	72′ S.	74′ W.	42° 38′		103′ W.	13° 0′		Porto Santo, S. 15° W., 596 m.

The variation, as observed by an amplitude, being 21° W., the courses are corrected to the nearest degree before they are inserted in the Traverse Table.

Course.	Dist.	N.	S.	E.	W.
S. 83° W.	20		2.4		19.9
S. 69 W.	15		5.4		14.0
S. 41 W.	35		26.4		23.0
S. 24 W.	41		37.5		16.7
	Diff. lat.		71.7	Dep.	73.6

The diff. of lat. 71′.7, and dep. 73′.6, give the course S. 46° W., and distance 102 miles.

Yesterday's lat.... 43° 50′ N...Mer. Parts.. 2932

Diff. of lat. 72′, or 1 12 S.

Latitude in by acc. 42 38 N...Mer. Parts.. 2833

Mer. diff. lat. 99

The course 46°, and the mer. diff. of latitude 99′, give the difference of longitude 103 miles, or ..... 1° 43′ W.

Yesterday's longitude..... 11 17 W.

Longitude in by account ..... 13 0 W.

To find the Bearing and Distance of Porto Santo.

Latitude of ship ... 42° 38′ N.....Mer. Parts... 2833 Longitude of ship ... 13° 0′ W

Lat. of Porto Santo 33 3 N.....Mer. Parts... 2103 Long. of Porto Santo 16 17 W.

Diff. of latitude ... 9 35=575′ Mer. diff. lat. 730 Diff. of longitude ... 3 17=197′

The mer. diff. lat. 730′, and the diff. of long. 197′, give the true course S. 15° W.; this course, and the proper diff. of lat. 575′, give the distance 596 miles. The course to be steered is therefore S. 36° W., or S. W. ½ S.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks. Wednesday, June 22, 1870.
1	4		S. W.	S. E.		Variable light breezes and calms, with hot sultry weather.
2	4					
3	3	6				People and tradesmen employed variously.
4	3	2				
5	3					
6	2	4				
7	2	4		Variable.		
8	3					
9	2					
10	2					
11	2					
12	1					
1	)					
2	)					
3	)			Calm.		
4	)					
5	)					Tried the current, and found it setting N.E. by N., at the rate of ½ a mile per hour.
6	)					
7	1		S. W. by S.	N. E. by E.		
8	1	6				
9	2					
10	2	4		E. by N.		Lat. obs. by mer. alt. 42° 3′ N.
11	3					
12	3	0				Variation per azimuth 20° 19′ W.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. 24° W.	35′	32′ S.	14′ W.	42° 6′	42° 3′	19′ W.	13° 19′		Porto Santo, S. 15° W., 558 m.

By this day's log it appears that the current set N. E. by N. by compass, which, corrected for variation, is N. 13° E.; and the drift was at the rate of half-a-mile per hour, making 12 miles in the 24 hours; these are therefore set down in the Traverse Table as a course and distance.

Courses.	Dist.	N.	S.	E.	W.
S. 25° W.	33		29.9		13.9
S. 13 W.	14		13.6		3.1
N. 13 E.	12	11.7		2.7	
		11.7	43.5	2.7	17.0
			11.7		2.7
	Diff. lat.		31.8	Dep.	14.3

The diff. of lat. 31′.8, and dep. 14′.3, give the course S. 24° W., and distance 35 miles.

Yesterday's lat.... 42° 38′ N...Mer. Parts.. 2833
Diff. of latitude... 32 S.

Latitude in by acc. 42 6 N...Mer. Parts.. 2790
Sum of lats. 84 44
Middle lat..... 42 22 Mer. diff. lat. 43
Comp. mid. lat.... 47 38

The comp. of mid. lat. 47° 38′, and the departure 14′.3, or the course 24°, and the mer. diff. of lat. 43, give the diff. of longitude..... 0° 19′ W.

Yesterday's longitude..... 13 0 W.

Longitude in by account ..... 13 19 W.

To find the Bearing and Distance of Porto Santo.

Latitude of ship ... 42° 3′ N.....Mer. Parts... 2786 Longitude of ship ... 13° 19′ W.
Lat. of Porto Santo 33 3 N.....Mer. Parts... 2103 Long. of Porto Santo 16 17 W.

Diff. of latitude ... 9 0=540′ Mer. diff. lat. 683 Diff. of longitude ... 2 58=178′

The mer. diff. of lat. 683′, and diff. of longitude 178′, give the true course S. 15° W.; this course, and the proper diff. of lat. 540′, give the distance 558 miles. Hence the course *by compass is S. 35° W.*, or S. W. by S. nearly.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Thursday. June 23, 1870.
1	4		S. S.W. ½ W.	E. by N.		An increasing breeze throughout, with fair weather and smooth water. Employed as yesterday.
2	4	4				
3	5					
4	5					
5	5					
6	5	2				
7	5	6		Variable.		
8	6					
9	6					
10	6	4		S. E. by E.		
11	7					
12	7					
1	7					
2	7					
3	7					
4	8		S. W. by W.	S. E.		
5	7					
6	7	4				
7	7	6	S. W.	S. E. ½ S.		
8	7	2				
9	8					
10	8					Lat. obs. by mer. alt. 39° 36′ N.
11	7	4				
12	7	4				Variation 1¾ point West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. 17° W.	153′	146′ S.	46′ W.	39°37′	39°36′	59′ W.	14° 18′	14° 30′	Porto Santo, S. by W., 402m.

The courses being corrected for variation, with the corresponding distances, will be as in the Traverse Table.

Courses.	Dist.	N.	S.	E.	W.
S. ¾ W.	88		87.0		12.9
S. W. ¾ S.	22		17.7		13.1
S. S. W. ½ W.	46		41.6		19.7
	Diff. lat.		146.3	Dep.	45.7

The diff. of lat. 146′.3, and dep. 45′.7, give the course S. 17° W., and distance 153 miles.

Yesterday's lat.... 42° 3′ N...Mer. Parts.. 2786
Diff. of lat. 146′, or 2 26 S.

Latitude in ..... 39 37 N...Mer. Parts.. 2593
Sum of latitudes.. 81 40
Middle latitude... 40 50 Mer. diff. lat. 193
Comp. of mid lat. 49 10

The comp. of mid. latitude 49° 10′, and the departure 45′.7, give the diff. of longitude 61 miles: or the course 17°, and mer. diff. of latitude 193, give the difference of longitude ..... 0° 59′ W.

Yesterday's longitude..... 13 19 W.

Longitude in by account ..... 14 18 W.

To find the Bearing and Distance of Porto Santo.

Latitude of ship ... 39° 36′ N.....Mer. Parts... 2591
Lat. of Porto Santo 33 3 N.....Mer. Parts... 2103

Diff. of latitude ... 6 33 = 393′ Mer. diff. lat. 488

Longitude of ship ... 14° 30′ W.
Long. of Porto Santo 16 17 W.

Diff. of longitude ... 1 47 = 107′

Hence the bearing of Porto Santo is S. 12° W., or S. by W. nearly, and the distance 402 miles. The course therefore to be steered is S. S. W. ¾ W.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Friday, June 24, 1870.
1	7	4	S. W.	S. E.		A fresh breeze throughout, with passing squalls, and rain at times.
2	7	6				
3	8					
4	8					People and tradesmen employed as yesterday.
5	8					Gunner painting the boats.
6	8					
7	8					
8	8					
9	8					
10	8	4		S. E. by E.		In 1st reef of the topsails.
11	8	2				
12	8					
1	7	4				
2	7	4		S. E.		
3	7					
4	7					
5	7					
6	8					
7	8					
8	8		S. W. ½ W.	S. E. by S.		Lat. obs. by mer. alt. 36° 50′ N.
9	8					
10	7	6				
11	7	4				
12	7					Variation per azimuth 18° 42′ West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. 27° W.	186′	165′ S.	85′ W.	36°51′	36°50′	107′ W.	16° 5′	16° 17′	Porto Santo, South, 227 m.

The courses corrected for variation to the nearest degree, with the corresponding distances, will be as under

Courses.	Dist.	N.	S.	E.	W.
S. 26° W.	148		133. 0		64. 9
S. 32 W.	38		32. 2		20. 1
		Diff. lat.	165. 2	Dep.	85. 0

The diff. of lat. 165′. 2, and dep. 85′. 0, give the course S. 27° W., and distance 186 miles.

Yesterday's lat.... 39° 36′ N...Mer. Parts.. 259
Diff. of lat. 165′, or 2 45 S.

Latitude in ..... 36 51 N...Mer. Parts.. 2381
Sum of latitudes.. 76 27
Middle latitude... 38 13 Mer. diff. lat. 210
Co. mid. latitude. 51 47

The comp. of mid. latitude 51° 47′, and the departure 85′. 0, give the diff. of longitude 98 miles; or the course 27°, and the mer. diff. of latitude 210, give the diff. of longitude 107 miles.

Yesterday's long by acc..... 14° 18′ W.
Diff. of long. 107 miles, or... 1 47 W.

Longitude in by account..... 16 5 W.

Yesterday's long. by obs. ..... 14° 30′ W.
Diff. of long. 107 miles, or... 1 47 W.

Long. brought up from last obs. 16 17 W.

To find the Bearing and Distance of Porto Santo.

Latitude of ship ... 36° 50′ N.....Mer. Parts... 2380
Lat. of Porto Santo 33 3 N.....Mer. Parts... 2103

Diff. of latitude ... 3 47 = 227′ Mer. diff. lat. 277

Longitude of ship ... 16° 17′ W.
Long. of Porto Santo 16 17 W

Diff. of longitude ... 0

Hence the true course to Porto Santo is South, or the magnetic course S. by W. ½ W. nearly, and the distance 227 miles.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Saturday, June 25, 1870.
1	7	4	S. W.	S. S. E.		First part a fresh breeze, middle and latter more moderate, and smooth water.
2	7					
3	7					
4	7					
5	6	6				
6	6					
7	6					
8	5					
9	5		W. S. W.	South.	¼	
10	5					
11	5					
12	4	6	S. E. by E.	S. by W.	1	
1	4	6				
2	5					
3	4	4				
4	4					
5	4					
6	4		S. E. by S.	S. W. by S.	1	
7	4	4				
8	4					
9	3	6				Tacked.
10	3	2	West.	S. S. W.	1½	Lat. obs. by mer. alt. 35° 46′ N.
11	3					
12	3					Variation 1½ point West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. 4° W.	65′	64′ S.	5′ W.	35° 46′	35° 46′	6′ W.	16° 11′	16° 23′	Porto Santo, South, 163m.

The courses corrected for variation and leeway, with their corresponding distances, will be as under.

Courses.	Dist.	N.	S.	E.	W.
S. S. W. ½ W.	52		45.9		24.5
S. W. by W.	15		8.3		12.5
E. ½ S.	27		2.6	26.9	
E. S. E. ½ S.	16		7.5	14.1	
West.	9				9.0
	Diff. lat.		64.3	41.0	46.0
					41.0
				Dep.	5 0

The diff. of lat. 64′.3, and dep. 5′.0, give the course S. 4° W., and distance 65 miles.

Yesterday's lat.... 36° 50′ N...Mer. Parts.. 2380
Diff. of lat. 64′, or 1 4 S.

Latitude in ..... 35 46 N...Mer. Parts.. 2301
Sum of latitudes.. 72 36
Middle latitude... 36 18 Mer. diff. lat. 79
Co. mid. latitude. 53 42

The comp. of mid. lat. 53° 42′, and the departure 5′.0, or the course 4°, and the mer. diff. of lat. 79′. give the diff. of longitude 0° 6′ W..... 0° 6′ W.

Yesterday's long. by account... 16 5 W. Yesterday's long. from last obs. 16 17 W.

Long. in by account ..... 16 11 W. Long. in from last obs. ..... 16 23 W.

To find the Bearing and Distance of Porto Santo.

Latitude of ship ... 35° 46′ N.....Mer. Parts... 2301 Longitude of ship ..... 16° 23′ W
Lat. of Porto Santo 33 3 N.....Mer. Parts... 2103 Long. of Porto Santo... 16 17 W

Diff. of latitude ... 2 43=163′ Mer. diff. lat. 198 Diff. of longitude 6

Hence the true bearing is South nearly, and the distance 163 miles. The course to be steered is therefore S. by W. ½ W.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Sunday. June 26. 1870.
1	3		West.	S. S. W.	1½	
2	3					An increasing breeze, and fair.
3	4					
4	4	6	S. W. by W.	S. by E.	1	P. M. bent the best bower and sheet cables,
5	5					and unstowed the anchors. People other-
6	5					wise employed, reeving the harbour-geer,
7	5	4				and in sundry small jobs.
8	6		South.	East.		
9	6					
10	6					
11	6		S. S. E.			
12	6					
1	6	4		E. N. E.		
2	6	6				
3	6	6				
4	7					
5	7					
6	7					
7	7			N. E. by E.		
8	7					
9	7	4				
10	8					Lat. obs. by mer. alt. 33° 56′ N.
11	8			N. E.		
12	7	4				Variation 1½ point West.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.
S. 21½° F	113′	106′ S.	42′ E.	34° 0′	33° 56′	51′ E.	15° 20′	15° 32′	Porto Santo, S. 35° W., 65m.

Courses.	Dist.	N.	S.	E.	W.
West.	10				10.0
S. W. ½ W.	20		12.7		15.5
S. by E. ½ E.	18		17.2	5.2	
S. E. ½ S.	98		75.7	62.2	
	Diff. lat.		105.6	67.4	25.5
				25.5	
			Dep.	41.9	

The diff. of lat. 105′. 6, and dep. 41′. 9, give the course S. 21½° E., and distance 113 miles.

Yesterday's lat.... 35° 46′ N...Mer. Parts.. 2301
Diff. of lat. 106′, or 1 46 S.

Latitude in ..... 34 0 N...Mer. Parts.. 2171
Sum of latitudes.. 69 46
Middle latitude... 34 53 Mer. diff. lat. 130
Co. mid. latitude. 55 7

The comp. of mid latitude 55° 7′ and the departure 41′. 9, or the course 21½° and the mer. diff. of lat 130, give the diff. of longitude 51 miles.

Yesterday's long. by acc..... 16° 11′ W.
Diff. of longitude..... 51 E.

Longitude in by account..... 15 20 W

Yesterday's long. by obs..... 16° 23′ W.
Diff. of longitude..... 51 E.

Long. in from last obs..... 15 32 W.

To find the Bearing and Distance of Porto Santo.

Latitude of ship ... 33° 56′ N... ...Mer. Parts... 2167
Lat. of Porto Santo 33 3 N.....Mer. Parts... 2103

Diff. of latitude ... 53 Mer. diff. lat. 64

Longitude of ship ..... 15° 32′ W.
Long. of Porto Santo... 16 17 W.

Diff. of longitude 45

Hence the true bearing is S. 35° W., and the distance 65 miles. The course to be steered *is therefore S. 52° W., or* S. W. ½ W.

SHIP BRITANNIA from ENGLAND towards MADEIRA.

H.	K.	F.	Courses.	Winds.	Lee-way.	Remarks, Monday, June 27, 1870.
1	7	2	S. W. by S.	N. E.		A pleasant breeze, and fair throughout.
2	7					P. M. bent the small bower cable, and unstowed the anchor.
3	6	4				
4	6					
5	5	4	S. W. by W.	E. N. E.		
6	5					Saw the land bearing S. W. by S.
7	5	2				
8	5					
9	5	2		East.		Porto Santo W. S. W. about 5 leagues.
10						At 10 P. M. brought to. Main topsail to the
11						mast.
12			Lying-to.			
1						
2						
3			W. S. W.			At daylight made sail.
4						
5						
6						Porto Santo N. W. by N. Deserters S. W. by S.
7						East end of Madeira W. by S.
8						
9			W. by S.			At noon came to an anchor in Funchal Roads,
10			Various.			with the best bower, in 25 fathoms, mud
11						and sand; off shore ¼ of a mile; Loo Castle
12						bearing N. N. W., and Fort Lorenzo E. N. E.

Course.	Dist.	Diff. lat.	Dep.	Latitude N. Acc.	Latitude N. Obs.	Diff. long.	Longitude W. Acc.	Longitude W. Obs.	Bearing and Distance at noon.

The courses steered from noon to 9h. P. M., and the bearing of Porto Santo from the ship at that time, corrected for 1½ point West variation; also the distances run and the estimated distance of the ship from the land, being entered in a Traverse Table, will give the diff. of latitude 55′. 4, and the departure 35′. 9

From hence the latitude of Porto Santo, by the ship's reckoning, is found to be 33° 1′ N., and the longitude, carried on from the last lunar observation, 16° 15′ W.; differing 2 miles in latitude, and 4 miles in longitude, from its position, as laid down in Table XVIII.

ABSTRACT OF THE PRECEDING JOURNAL.

Week Days.	Date.	Winds.	Courses.	Dist.	Lat. by Acc.	Lat. by Obs.	Long. by Acc.	Long. by Obs.	True Bearings and Distances at Noon.
Wednesday.	1870, June 15	E. N. E. N. by W.	S. 37° W.	81	48° 53′ N.		6° 27′ W.		
Thursday...	16	N. by W. S. S. W.	S. 42° W.	64	48 6		7 31		C. Finisterre, S. 13½° W., 319 miles.
Friday	17	S. S. W. S.	S. 74° W.	75	47 45	47° 43′ N.	9 19		C. Finisterre, South, 287 miles.
Saturday ...	18	S. S. W. W. by S.	S. 7° E.	92	46 11	46 3	9 1		C. Finisterre, S. ¼ W., 187 miles.
Sunday	19	W. by S. S. S. W.	S. 33° W.	124	44 26	44 19	10 37		C. Finisterre, S. E. by S., 101 miles.
Monday.....	20	Variable.	S. W.	41	43 50		11 17		C. Finisterre, S. E. by E. ¼ E., 102 miles.
Tuesday.....	21	S. S. W. S. E. by S.	S. 46° W.	102	42 38		13 0		Porto Santo, S. 15° W., 596 miles.
Wednesday.	22	Variable.	S. 24° W.	35	42 6	42 3	13 19		Porto Santo, S. 15° W., 558 miles.
Thursday ...	23	Variable.	S. 17° W.	153	39 37	39 36	14 18	14° 30′ W.	Porto Santo, S. by W., 402 miles.
Friday	24	S. E.	S. 27° W.	186	36 51	36 50	16 5	16 17	Porto Santo, South, 227 miles.
Saturday ...	25	S. S. E. S. S. W.	S. 4° W.	65	35 46	35 46	16 11	16 23	Porto Santo, South, 163 miles.
Sunday	26	S. S. W. N. Easterly.	S. 21½° E.	113	34 0	33 56	15 20	15 32	Porto Santo, S. 35° W., 65 miles.
Monday.....	27	N. E. East.							Anchored in Funchal Roads.

Log and Day's Work with Deviation.

As Iron Ship's and Steamers have Deviation of the Compass, and the Log already given is supposed to be that of a Wooden Vessel, we append a form of Log and Day's Work with Deviation, and give the method of solution.

H.	K.	T.	Courses.	Winds.	Lee-way	Dev.	Remarks.
1	6	6	S. by W. ½ W.	W. by S.	¼	5° E.	P.M. The Departure is taken from the Old Head of Kinsale in Lat. 51° 37′ N. Long. 8° 32′ W. bearing by Compass N.W. distant 12 miles; Ship heading S. by W. ½ W. with Deviation 5° E.
2	6	4					
3	6	6					
4	6	4					
5	7	0	S.W. ¾ W.	W.N.W.	¼	9° W.	
6	7	4					
7	7	6					
8	8	0					
9	8	0	W.S.W.	N.W.	½	12° W.	
10	7	6					
11	7	4					
12	7	0					
1	7	0					A.M.
2	6	6					
3	6	4					Variation 24° W.
4	7	0	N. ¼ W.	W.N.W.	¾	4° W.	
5	7	6					
6	7	6					
7	8	4					
8	7	4					Allow for Current setting W. by N. (correct magnetic) 14 miles, during the last 16 hours.
9	8	0	S.E. ½ E.	S.W.	0	11° E.	
10	8	0					
11	7	6					
12	8	4					

Dep. Co.	1st Co.	2nd Co.
S. 45° E.	S. 1¼ W.	S. 4¾ W.
5 E.	¼	¼
S. 40 E.	S. 1¼ pt. W.	S. 4½ W.
24 W.	S. 14° W.	S. 51° W.
S. 64 E	5 E.	33 W.
	S. 19 W.	S. 18 W.
	24 W.	
Or S. 45° E.		
24 − 5 = 19 W.	S. 5 E.	
S. 64 E.	&c., &c.	

Corrected Courses.	Dist.	Diff. Lat. N.	Diff. Lat. S.	Departure. E.	Departure. W.
S. 64° E.	12		5·3	10·8	
S. 5 E.	26		25·9	2·3	
S. 18 W.	30		28·5		9·3
S. 26 W.	50		44·9		21·9
N. 22 W.	38	35·2			14·2
S. 64 E.	32		14·0	28·8	
S. 77 W.	14		3·1		13·6
		35·2	121·7	41·9	59.0
			35·2		41·9
		Diff. Lat. 86·5		Dep.	17·1

Prove the rest yourself: to Current only allow Var.

Lat. left. 51° 37′ N.
Diff. Lat. 86·5 = 1 27 S.

Lat. in 50 10 N.

2)101 47

Mid. Lat. 50 53

Mid. Lat. 51° and Dep. 17·1 (in Lat. col.) Trav. Tab. II. give 27 in Dist. col., for Diff. Long.

Long. left 8° 32′ W.
Diff. Long 27 W.

Long. in 8 59 W.

Diff. Lat. 86·5 S. and Dep. 17·1 W. in Trav. Tab. I. give Course made good S. by W., and Dist. 88 miles.

And our Log-Book form would be entered as follows:—

Course made good	Dist. run.	Diff. Lat.	Dep.	Latitude.		Diff. Long.	Longitude.	
				By D. R.	By Obs.		By D. R.	By Obs.
S. by W.	88 m.	86′·5 S.	17′·1 W.	51° 10′ N.	51° 8′ N.	27′ W.	8° 59′ W.	9° 4′ W.

I have filled in a Lat. and Long. *by observation* to show that at the end of the next day (24 hours), when working up the reckoning, they will be taken as our *departure* Lat. and Long. Thus, *suppose* our Courses and Distances for the 24 hours gave us Diff. Lat. 72′·9 S., and Dep. 143′·6 W.

Then, with these we get Course made good S. 63° W. and Dist. 161 miles; also—

By Obs. Lat. left... 51° 8′ N.
Diff. Lat. 73′ = ... 1 13 S.

Lat. in by D. R. ... 49 55

2) 101 3

Mid Lat. ... 50 31

Mid Lat. 50½° and Dep. 143·6 (in Lat. col.) give Diff. Long. 226, by searching Trav. Tab. first for 50° and then 51°, and taking the mean.

By Obs. Long. left ... 9° 4′ W.
Diff. Long. 226′ = ... 3 46 W.

Long. in by D. R. ... 12 50 W.

TABLE I.

Difference of Latitude and Departure for ¼ Point.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.0	61	60.9	03.0	121	120.9	05.9	181	180.8	08.9	241	240.7	11.8
2	02.0	00.1	62	61.9	03.0	122	121.9	06.0	182	181.8	08.9	242	241.7	11.9
3	03.0	00.1	63	62.9	03.1	123	122.9	06.0	183	182.8	09.0	243	242.7	11.9
4	04.0	00.2	64	63.9	03.1	124	123.9	06.1	184	183.8	09.0	244	243.7	12.0
5	05.0	00.2	65	64.9	03.2	125	124.9	06.1	185	184.8	09.1	245	244.7	12.0
6	06.0	00.3	66	65.9	03.2	126	125.8	06.2	186	185.8	09.1	246	245.7	12.1
7	07.0	00.3	67	66.9	03.3	127	126.8	06.2	187	186.8	09.2	247	246.7	12.1
8	08.0	00.4	68	67.9	03.3	128	127.8	06.3	188	187.8	09.2	248	247.7	12.2
9	09.0	00.4	69	68.9	03.4	129	128.8	06.3	189	188.8	09.3	249	248.7	12.2
10	10.0	00.5	70	69.9	03.4	130	129.8	06.4	190	189.8	09.3	250	249.7	12.3
11	11.0	00.5	71	70.9	03.5	131	130.8	06.4	191	190.8	09.4	251	250.7	12.3
12	12.0	00.6	72	71.9	03.5	132	131.8	06.5	192	191.8	09.4	252	251.7	12.4
13	13.0	00.6	73	72.9	03.6	133	132.8	06.5	193	192.8	09.5	253	252.7	12.4
14	14.0	00.7	74	73.9	03.6	134	133.8	06.6	194	193.8	09.5	254	253.7	12.5
15	15.0	00.7	75	74.9	03.7	135	134.8	06.6	195	194.8	09.6	255	254.7	12.5
16	16.0	00.8	76	75.9	03.7	136	135.8	06.7	196	195.8	09.6	256	255.7	12.6
17	17.0	00.8	77	76.9	03.8	137	136.8	06.7	197	196.8	09.7	257	256.7	12.6
18	18.0	00.9	78	77.9	03.8	138	137.8	06.8	198	197.8	09.7	258	257.7	12.7
19	19.0	00.9	79	78.9	03.9	139	138.8	06.8	199	198.8	09.8	259	258.7	12.7
20	20.0	01.0	80	79.9	03.9	140	139.8	06.9	200	199.8	09.8	260	259.7	12.8
21	21.0	01.0	81	80.9	04.0	141	140.8	06.9	201	200.8	09.9	261	260.7	12.8
22	22.0	01.1	82	81.9	04.0	142	141.8	07.0	202	201.8	09.9	262	261.7	12.9
23	23.0	01.1	83	82.9	04.1	143	142.8	07.0	203	202.8	10.0	263	262.7	12.9
24	24.0	01.2	84	83.9	04.1	144	143.8	07.1	204	203.8	10.0	264	263.7	13.0
25	25.0	01.2	85	84.9	04.2	145	144.8	07.1	205	204.8	10.1	265	264.7	13.0
26	26.0	01.3	86	85.9	04.2	146	145.8	07.2	206	205.8	10.1	266	265.7	13.1
27	27.0	01.3	87	86.9	04.3	147	146.8	07.2	207	206.8	10.2	267	266.7	13.1
28	28.0	01.4	88	87.9	04.3	148	147.8	07.3	208	207.8	10.2	268	267.7	13.2
29	29.0	01.4	89	88.9	04.4	149	148.8	07.3	209	208.8	10.3	269	268.7	13.2
30	30.0	01.5	90	89.9	04.4	150	149.8	07.4	210	209.8	10.3	270	269.7	13.3
31	31.0	01.5	91	90.9	04.5	151	150.8	07.4	211	210.7	10.4	271	270.7	13.3
32	32.0	01.6	92	91.9	04.5	152	151.8	07.5	212	211.7	10.4	272	271.7	13.3
33	33.0	01.6	93	92.9	04.6	153	152.8	07.5	213	212.7	10.5	273	272.7	13.4
34	34.0	01.7	94	93.9	04.6	154	153.8	07.6	214	213.7	10.5	274	273.7	13.4
35	35.0	01.7	95	94.9	04.7	155	154.8	07.6	215	214.7	10.6	275	274.7	13.5
36	36.0	01.8	96	95.9	04.7	156	155.8	07.7	216	215.7	10.6	276	275.7	13.5
37	37.0	01.8	97	96.9	04.8	157	156.8	07.7	217	216.7	10.7	277	276.7	13.6
38	38.0	01.9	98	97.9	04.8	158	157.8	07.8	218	217.7	10.7	278	277.7	13.6
39	39.0	01.9	99	98.9	04.9	159	158.8	07.8	219	218.7	10.8	279	278.7	13.7
40	40.0	02.0	100	99.9	04.9	160	159.8	07.9	220	219.7	10.8	280	279.7	13.7
41	41.0	02.0	101	100.9	05.0	161	160.8	07.9	221	220.7	10.8	281	280.7	13.8
42	41.9	02.1	102	101.9	05.0	162	161.8	08.0	222	221.7	10.9	282	281.7	13.8
43	42.9	02.1	103	102.9	05.1	163	162.8	08.0	223	222.7	10.9	283	282.7	13.9
44	43.9	02.2	104	103.9	05.1	164	163.8	08.1	224	223.7	11.0	284	283.7	13.9
45	44.9	02.2	105	104.9	05.2	165	164.8	08.1	225	224.7	11.0	285	284.7	14.0
46	45.9	02.3	106	105.9	05.2	166	165.8	08.2	226	225.7	11.1	286	285.7	14.0
47	46.9	02.3	107	106.9	05.3	167	166.8	08.2	227	226.7	11.1	287	286.7	14.1
48	47.9	02.4	108	107.9	05.3	168	167.8	08.2	228	227.7	11.2	288	287.7	14.1
49	48.9	02.4	109	108.9	05.4	169	168.8	08.3	229	228.7	11.2	289	288.7	14.2
50	49.9	02.5	110	109.9	05.4	170	169.8	08.3	230	229.7	11.3	290	289.7	14.2
51	50.9	02.5	111	110.9	05.5	171	170.8	08.4	231	230.7	11.3	291	290.7	14.3
52	51.9	02.6	112	111.9	05.5	172	171.8	08.4	232	231.7	11.4	292	291.7	14.3
53	52.9	02.6	113	112.9	05.5	173	172.8	08.5	233	232.7	11.4	293	292.7	14.4
54	53.9	02.7	114	113.9	05.6	174	173.8	08.5	234	233.7	11.5	294	293.6	14.4
55	54.9	02.7	115	114.9	05.6	175	174.8	08.6	235	234.7	11.5	295	294.6	14.5
56	55.9	02.8	116	115.9	05.7	176	175.8	08.6	236	235.7	11.6	296	295.6	14.5
57	56.9	02.8	117	116.9	05.7	177	176.8	08.7	237	236.7	11.6	297	296.6	14.6
58	57.9	02.9	118	117.9	05.8	178	177.8	08.7	238	237.7	11.7	298	297.6	14.6
59	58.9	02.9	119	118.9	05.8	179	178.8	08.8	239	238.7	11.7	299	298.6	14.7
60	59.9	02.9	120	119.9	05.9	180	179.8	08.8	240	239.7	11.8	300	299.6	14.7
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for ½ Point.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.1	61	60.7	06.0	121	120.4	11.9	181	180.1	17.7	241	239.8	23.6
2	02.0	00.2	62	61.7	06.1	122	121.4	12.0	182	181.1	17.8	242	240.8	23.7
3	03.0	00.3	63	62 7	06.2	123	122.4	12.1	183	182.1	17 9	243	241.8	23.8
4	04.0	00.4	64	63.7	06.3	124	123.4	12.2	184	183.1	18.0	244	242.8	23.9
5	05.0	00.5	65	64.7	06.4	125	124.4	12.3	185	184.1	18.1	245	243.8	24.0
6	06.0	00.6	66	65.7	06.5	126	125.4	12.3	186	185.1	18.2	246	244.8	24.1
7	07.0	00.7	67	66.7	06.6	127	126.4	12.4	187	186.1	18.3	247	245.8	24.2
8	08.0	00.8	68	67.7	06.7	128	127.4	12.5	188	187.1	18.4	248	246.8	24.3
9	09.0	00.9	69	68 7	06.8	129	128.4	12.6	189	188.1	18.5	249	247.8	24.4
10	10.0	01.0	70	69.7	06.9	130	129.4	12.7	190	189.1	18.6	250	248.8	24.5
11	10.9	01.1	71	70.7	07.0	131	130.4	12.8	191	190.1	18.7	251	249.8	24.6
12	11.9	01.2	72	71.7	07.1	132	131.4	12.9	192	191.1	18.8	252	250.8	24.7
13	12.9	01.3	73	72.7	07.2	133	132.4	13.0	193	192.1	18.9	253	251.8	24.8
14	13.9	01.4	74	73.6	07.3	134	133.4	13.1	194	193.1	19.0	254	252.8	24.9
15	14.9	01.5	75	74.6	07.4	135	134.3	13.2	195	194.1	19.1	255	253.8	25.0
16	15.9	01.6	76	75.6	07.4	136	135.3	13.3	196	195.1	19.2	256	254.8	25.1
17	16.9	01.7	77	76.6	07.5	137	136.3	13.4	197	196.1	19.3	257	255.8	25.2
18	17.9	01.8	78	77.6	07.6	138	137.3	13.5	198	197.0	19.4	258	256.8	25.3
19	18.9	01.9	79	78.6	07.7	139	138.3	13.6	199	198.0	19.5	259	257.8	25.4
20	19.9	02.0	80	79.6	07.8	140	139.3	13.7	200	199.0	19.6	260	258.7	25.5
21	20.9	02.1	81	80.6	07.9	141	140.3	13.8	201	200.0	19.7	261	259.7	25.6
22	21.9	02.2	82	81.6	08.0	142	141.3	13.9	202	201.0	19.8	262	260.7	25.7
23	22.9	02.3	83	82.6	08.1	143	142.3	14.0	203	202.0	19.9	263	261.7	25.8
24	23.9	02.4	84	83.6	08.2	144	143.3	14.1	204	203.0	20.0	264	262.7	25.9
25	24.9	02.4	85	84.6	08.3	145	144.3	14.2	205	204.0	20.1	265	263.7	26.0
26	25.9	02 5	86	85.6	08.4	146	145.3	14.3	206	205.0	20.2	266	264.7	26.1
27	26.9	02.6	87	86.6	08.5	147	146.3	14.4	207	206.0	20.3	267	265.7	26.2
28	27.9	02.7	88	87.6	08.6	148	147.3	14.5	208	207.0	20.4	268	266.7	26.3
29	28.9	02.8	89	88.6	08.7	149	148.3	14.6	209	208.0	20.5	269	267.7	26.4
30	29.9	02.9	90	89.6	08.8	150	149.3	14.7	210	209.0	20.6	270	268.7	26.5
31	30.9	03.0	91	90.6	08.9	151	150.3	14.8	211	210.0	20.7	271	269.7	26.6
32	31.8	03.1	92	91.6	09.0	152	151.3	14.9	212	211.0	20.8	272	270.7	26.7
33	32.8	03.2	93	92.6	09.1	153	152.3	15.0	213	212.0	20.9	273	271.7	26.8
34	33.8	03.3	94	93.6	09.2	154	153.3	15.1	214	213.0	21.0	274	272.7	26.9
35	34.8	03.4	95	94.5	09.3	155	154.3	15.2	215	214.0	21.1	275	273.7	27.0
36	35.8	03.5	96	95.5	09.4	156	155.2	15.3	216	215.0	21.2	276	274.7	27.1
37	36.8	03.6	97	96.5	09.5	157	156.2	15.4	217	216.0	21.3	277	275.7	27.2
38	37.8	03.7	98	97.5	09.6	158	157.2	15.5	218	216.9	21.4	278	276.7	27.3
39	38.8	03.8	99	98.5	09.7	159	158.2	15.6	219	217.9	21.5	279	277.7	27.3
40	39.8	03.9	100	99.5	09.8	160	159.2	15.7	220	218.9	21.6	280	278.7	27.4
41	40.8	04.0	101	100.5	09.9	161	160.2	15.8	221	219.9	21 7	281	279.6	27.5
42	41.8	04.1	102	101.5	10.0	162	161.2	15.9	222	220.9	21.8	282	280.6	27.6
43	42.8	04.2	103	102.5	10.1	163	162.2	16.0	223	221.9	21.9	283	281.6	27.7
44	43.8	04.3	104	103.5	10.2	164	163.2	16.1	224	222.9	22.0	284	282.6	27.8
45	44.8	04.4	105	104.5	10.3	165	164.2	16.2	225	223.9	22.1	285	283.6	27.9
46	45.8	04.5	106	105.5	10.4	166	165.2	16.3	226	224.9	22.2	286	284.6	28.0
47	46.8	04.6	107	106.5	10.5	167	166.2	16.4	227	225.9	22.2	287	285.6	28.1
48	47.8	04.7	108	107.5	10.6	168	167.2	16.5	228	226.9	22.3	288	286.6	28.2
49	48.8	04.8	109	108.5	10.7	169	168.2	16.6	229	227.9	22.4	289	287.6	28.3
50	49.8	04.9	110	109.5	10.8	170	169.2	16.7	230	228.9	22.5	290	288.6	28.4
51	50.8	05.0	111	110.5	10.9	171	170.2	16.8	231	229.9	22.6	291	289.6	28.5
52	51.7	05.1	112	111.5	11.0	172	171.2	16.9	232	230.9	22.7	292	290.6	28.6
53	52.7	05.2	113	112.5	11.1	173	172.2	17.0	233	231.9	22.8	2/3	291 6	28.7
54	53.7	05.3	114	113.5	11.2	174	173.2	17.1	234	232.9	22.9	294	292.6	28.8
55	54.7	05.4	115	114.5	11.3	175	174.2	17.2	235	233.9	23.0	295	293.6	28.9
56	55.7	05.5	116	115.4	11.4	176	175.2	17.3	236	234.9	23.1	296	294.6	29.0
57	56.7	05.6	117	116.4	11.5	177	176.1	17.4	237	235.9	23.2	297	295.6	29.1
58	57.7	05.7	118	117.4	11.6	178	177.1	17.4	238	236.9	23.3	298	296.6	29.2
59	58.7	05.8	119	118.4	11.7	179	178.1	17.5	239	237.8	23.4	299	297.6	29.3
60	59.7	05.9	120	119.4	11.8	180	179.1	17.6	240	238.8	23.5	300	298.6	29.4
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for $\frac{3}{4}$ Point.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.1	61	60.3	08.9	121	119.7	17.7	181	179.0	26.6	241	238.4	35.4
2	02.0	00.3	62	61.3	09.1	122	120.7	17.9	182	180.0	26.7	242	239.4	35.5
3	03.0	00.4	63	62.3	09.2	123	121.7	18.0	183	181.0	26.8	243	240.4	35.7
4	04.0	00.6	64	63.3	09.4	124	122.7	18.2	184	182.0	27.0	244	241.4	35.8
5	04.9	00.7	65	64.3	09.5	125	123.6	18.3	185	183.0	27.1	245	242.3	35.9
6	05.9	00.9	66	65.3	09.7	126	124.6	18.5	186	184.0	27.3	246	243.3	36.1
7	06.9	01.0	67	66.3	09.8	127	125.6	18.6	187	185.0	27.4	247	244.3	36.2
8	07.9	01.2	68	67.3	10.0	128	126.6	18.8	188	186.0	27.6	248	245.3	36.4
9	08.9	01.3	69	68.2	10.1	129	127.6	18.9	189	186.9	27.7	249	246.3	36.5
10	09.9	01.5	70	69.2	10.3	130	128.6	19.1	190	187.9	27.9	250	247.3	36.7
11	10.9	01.6	71	70.2	10.4	131	129.6	19 2	191	188.9	28.0	251	248.3	36.8
12	11.9	01.8	72	71.2	10.6	132	130.6	19.4	192	189.9	28.2	252	249.3	37.0
13	12.9	01.9	73	72.2	10.7	133	131.6	19.5	193	190.9	28.3	253	250.3	37.1
14	13.8	02.1	74	73.2	10.9	134	132.5	19.7	194	191.9	28.5	254	251.2	37.3
15	14.8	02.2	75	74.2	11.0	135	133.5	19.8	195	192.9	28.6	255	252.2	37.4
16	15.8	02.3	76	75.2	11.1	136	134.5	20.0	196	193.9	28.8	256	253.2	37.6
17	16.8	02.5	77	76.2	11.3	137	135.5	20.1	197	194.9	28.9	257	254.2	37.7
18	17.8	02.6	78	77.2	11.4	138	136.5	20.2	198	195.9	29.0	258	255.2	37.9
19	18.8	02.8	79	78.1	11.6	139	137.5	20.4	199	196.8	29.2	259	256.2	38.0
20	19.8	02.9	80	79.1	11.7	140	138.5	20.5	200	197.8	29.3	260	257.2	38.1
21	20.8	03.1	81	80.1	11.9	141	139.5	20.7	201	198.8	29.5	261	258.2	38.3
22	21.8	03.2	82	81.1	12.0	142	140.5	20.8	202	199.8	29.6	262	259.2	38.4
23	22.7	03.4	83	82.1	12.2	143	141.4	21.0	203	200.8	29.8	263	260.1	38.6
24	23.7	03.5	84	83.1	12.3	144	142.4	21.1	204	201.8	29.9	264	261.1	38.7
25	24.7	03.7	85	84.1	12.5	145	143.4	21.3	205	202.8	30.1	265	262.1	38.9
26	25.7	03.8	86	85.1	12.6	146	144.4	21.4	206	203.8	30.2	266	263.1	39 0
27	26.7	04.0	87	86.1	12.8	147	145.4	21.6	207	204.8	30.4	267	264.1	39.2
28	27.7	04.1	88	87.0	12.9	148	146.4	21.7	208	205.7	30.5	268	265.1	39.3
29	28.7	04.3	89	88.0	13.1	149	147.4	21.9	209	206.7	30.7	269	266.1	39.5
30	29.7	04.4	90	89.0	13.2	150	148.4	22.0	210	207.7	30.8	270	267.1	39.6
31	30.7	04.5	91	90.0	13.3	151	149.4	22.2	211	208.7	30.9	271	268.1	39.8
32	31.7	04.7	92	91.0	13.5	152	150.3	22.3	212	209.7	31.1	272	269.0	39.9
33	32.6	04.8	93	92.0	13.6	153	151.3	22.4	213	210.7	31.2	273	270.0	40.1
34	33.6	05.0	94	93.0	13.8	154	152.3	22.6	214	211.7	31.4	274	271.0	40.2
35	34.6	05.1	95	94.0	13.9	155	153.3	22.7	215	212.7	31.5	275	272.0	40.3
36	35.6	05.3	96	95.0	14.1	156	154.3	22.9	216	213.7	31.7	276	273.0	40.5
37	36.6	05.4	97	95.9	14.2	157	155.3	23.0	217	214.6	31.8	277	274.0	40.6
38	37.6	05.6	98	96.9	14.4	1 8	156.3	23.2	218	215.6	32.0	278	275.0	40.8
39	38.6	05.7	99	97.9	14.5	159	157.3	23.3	219	216.6	32.1	279	276.0	40.9
40	39.6	05.9	100	98.9	14.7	160	158.3	23.5	220	217.6	32.3	280	277.0	41.1
41	40.6	06.0	101	99.9	14.8	161	159.3	23.6	221	218.6	32.4	281	278.0	41.2
42	41.5	06.2	102	100.9	15.0	162	160.2	23.8	222	219.6	32.6	282	278.9	41.4
43	42.5	06.3	103	101.9	15.1	163	161.2	23.9	223	220.6	32.7	283	279 9	41.5
44	43.5	06.5	104	102.9	15.3	164	162.2	24.1	224	221.6	32.9	284	280.9	41.7
45	44.5	06.6	105	103.9	15.4	165	163.2	24.2	225	222.6	33.0	285	281.9	41.8
46	45.5	06.7	106	104.8	15.5	166	164.2	24.4	226	223.5	33.2	286	282.9	42.0
47	46.5	06.9	107	105.8	15.7	167	165.2	24.5	227	224.5	33.3	287	283.9	42.1
48	47.5	07.0	108	106.8	15.8	168	166.2	24.6	228	225.5	33.4	288	284.9	42.3
49	48.5	07.2	109	107.8	16.0	169	167.2	24.8	229	226.5	33.6	289	285.9	42.4
50	49.5	07.3	110	108.8	16.1	170	168.2	24.9	230	227.5	33.7	290	286.9	42.5
51	50.4	07.5	111	109.8	16.3	171	169.1	25.1	231	228.5	33.9	291	287 8	42.7
52	51.4	07.6	112	110.8	16.4	172	170.1	25.2	232	229.5	34 0	292	288.8	42.8
53	52.4	07.8	113	111.8	16.6	173	171.1	25.4	233	230.5	34.2	293	289.8	43.0
54	53.4	07.9	114	112.8	16.7	174	172.1	25.5	234	231.5	34.3	294	290.8	43.1
55	54.4	08.1	115	113.7	16.9	175	173.1	25.7	235	232.4	34.5	295	291.8	43.3
56	55.4	08.2	116	114.7	17.0	176	174.1	25.8	236	233.4	34.6	296	292.8	43.4
57	56.4	08.4	117	115.7	17.2	177	175.1	26.0	237	234.4	34.8	297	293.8	43.6
58	57.4	08.5	118	116.7	17.3	178	176.1	26.1	238	235.4	34.9	298	294.8	43.7
59	58.4	08.7	119	117.7	17.5	179	177.1	26.3	239	236.4	35.1	299	295.8	43.9
60	59.3	08.8	120	118.7	17 6	180	178.0	26.4	240	237.4	35.2	300	296.8	44.0
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE I.

Difference of Latitude and Departure for ¼ Point.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.0	61	60.9	03.0	121	120.9	05.9	181	180.8	08.9	241	240.7	11.8
2	02.0	00.1	62	61.9	03.0	122	121.9	06.0	182	181.8	08.9	242	241.7	11.9
3	03.0	00.1	63	62.9	03.1	123	122.9	06.0	183	182.8	09.0	243	242.7	11.9
4	04.0	00.2	64	63.9	03.1	124	123.9	06.1	184	183.8	09.0	244	243.7	12.0
5	05.0	00.2	65	64.9	03.2	125	124.9	06.1	185	184.8	09.1	245	244.7	12.0
6	06.0	00.3	66	65.9	03.2	126	125.8	06.2	186	185.8	09.1	246	245.7	12.1
7	07.0	00.3	67	66.9	03.3	127	126.8	06.2	187	186.8	09.2	247	246.7	12.1
8	08.0	00.4	68	67.9	03.3	128	127.8	06.3	188	187.8	09.2	248	247.7	12.2
9	09.0	00.4	69	68.9	03.4	129	128.8	06.3	189	188.8	09.3	249	248.7	12.2
10	10.0	00.5	70	69.9	03.4	130	129.8	06.4	190	189.8	09.3	250	249.7	12.3
11	11.0	00.5	71	70.9	03.5	131	130.8	06.4	191	190.8	09.4	251	250.7	12.3
12	12.0	00.6	72	71.9	03.5	132	131.8	06.5	192	191.8	09.4	252	251.7	12.4
13	13.0	00.6	73	72.9	03.6	133	132.8	06.5	193	192.8	09.5	253	252.7	12.4
14	14.0	00.7	74	73.9	03.6	134	133.8	06.6	194	193.8	09.5	254	253.7	12.5
15	15.0	00.7	75	74.9	03.7	135	134.8	06.6	195	194.8	09.6	255	254.7	12.5
16	16.0	00.8	76	75.9	03.7	136	135.8	06.7	196	195.8	09.6	256	255.7	12.6
17	17.0	00.8	77	76.9	03.8	137	136.8	06.7	197	196.8	09.7	257	256.7	12.6
18	18.0	00.9	78	77.9	03.8	138	137.8	06.8	198	197.8	09.7	258	257.7	12.7
19	19.0	00.9	79	78.9	03.9	139	138.8	06.8	199	198.8	09.8	259	258.7	12.7
20	20.0	01.0	80	79.9	03.9	140	139.8	06.9	200	199.8	09.8	260	259.7	12.8
21	21.0	01.0	81	80.9	04.0	141	140.8	06.9	201	200.8	09.9	261	260.7	12.8
22	22.0	01.1	82	81.9	04.0	142	141.8	07.0	202	201.8	09.9	262	261.7	12.9
23	23.0	01.1	83	82.9	04.1	143	142.8	07.0	203	202.8	10.0	263	262.7	12.9
24	24.0	01.2	84	83.9	04.1	144	143.8	07.1	204	203.8	10.0	264	263.7	13.0
25	25.0	01.2	85	84.9	04.2	145	144.8	07.1	205	204.8	10.1	265	264.7	13.0
26	26.0	01.3	86	85.9	04.2	146	145.8	07.2	206	205.8	10.1	266	265.7	13.1
27	27.0	01.3	87	86.9	04.3	147	146.8	07.2	207	206.8	10.2	267	266.7	13.1
28	28.0	01.4	88	87.9	04.3	148	147.8	07.3	208	207.8	10.2	268	267.7	13.2
29	29.0	01.4	89	88.9	04.4	149	148.8	07.3	209	208.8	10.3	269	268.7	13.2
30	30.0	01.5	90	89.9	04.4	150	149.8	07.4	210	209.8	10.3	270	269.7	13.3
31	31.0	01.5	91	90.9	04.5	151	150.8	07.4	211	210.7	10.4	271	270.7	13.3
32	32.0	01.6	92	91.9	04.5	152	151.8	07.5	212	211.7	10.4	272	271.7	13.3
33	33.0	01.6	93	92.9	04.6	153	152.8	07.5	213	212.7	10.5	273	272.7	13.4
34	34.0	01.7	94	93.9	04.6	154	153.8	07.6	214	213.7	10.5	274	273.7	13.4
35	35.0	01.7	95	94.9	04.7	155	154.8	07.6	215	214.7	10.6	275	274.7	13.5
36	36.0	01.8	96	95.9	04.7	156	155.8	07.7	216	215.7	10.6	276	275.7	13.5
37	37.0	01.8	97	96.9	04.8	157	156.8	07.7	217	216.7	10.7	277	276.7	13.6
38	38.0	01.9	98	97.9	04.8	158	157.8	07.8	218	217.7	10.7	278	277.7	13.6
39	39.0	01.9	99	98.9	04.9	159	158.8	07.8	219	218.7	10.8	279	278.7	13.7
40	40.0	02.0	100	99.9	04.9	160	159.8	07.9	220	219.7	10.8	280	279.7	13.7
41	41.0	02.0	101	100.9	05.0	161	160.8	07.9	221	220.7	10.8	281	280.7	13.8
42	41.9	02.1	102	101.9	05.0	162	161.8	08.0	222	221.7	10.9	282	281.7	13.8
43	42.9	02.1	103	102.9	05.1	163	162.8	08.0	223	222.7	10.9	283	282.7	13.9
44	43.9	02.2	104	103.9	05.1	164	163.8	08.1	224	223.7	11.0	284	283.7	13.9
45	44.9	02.2	105	104.9	05.2	165	164.8	08.1	225	224.7	11.0	285	284.7	14.0
46	45.9	02.3	106	105.9	05.2	166	165.8	08.2	226	225.7	11.1	286	285.7	14.0
47	46.9	02.3	107	106.9	05.3	167	166.8	08.2	227	226.7	11.1	287	286.7	14.1
48	47.9	02.4	108	107.9	05.3	168	167.8	08.2	228	227.7	11.2	288	287.7	14.1
49	48.9	02.4	109	108.9	05.4	169	168.8	08.3	229	228.7	11.2	289	288.7	14.2
50	49.9	02.5	110	109.9	05.4	170	169.8	08.3	230	229.7	11.3	290	289.7	14.2
51	50.9	02.5	111	110.9	05.5	171	170.8	08.4	231	230.7	11.3	291	290.7	14.3
52	51.9	02.6	112	111.9	05.5	172	171.8	08.4	232	231.7	11.4	292	291.7	14.3
53	52.9	02.6	113	112.9	05.5	173	172.8	08.5	233	232.7	11.4	293	292.7	14.4
54	53.9	02.7	114	113.9	05.6	174	173.8	08.5	234	233.7	11.5	294	293.6	14.4
55	54.9	02.7	115	114.9	05.6	175	174.8	08.6	235	234.7	11.5	295	294.6	14.5
56	55.9	02.8	116	115.9	05.7	176	175.8	08.6	236	235.7	11.6	296	295.6	14.5
57	56.9	02.8	117	116.9	05.7	177	176.8	08.7	237	236.7	11.6	297	296.6	14.6
58	57.9	02.9	118	117.9	05.8	178	177.8	08.7	238	237.7	11.7	298	297.6	14.6
59	58.9	02.9	119	118.9	05.8	179	178.8	08.8	239	238.7	11.7	299	298.6	14.7
60	59.9	02.9	120	119.9	05.9	180	179.8	08.8	240	239.7	11.8	300	299.6	14.7
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for ¼ Point.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.1	61	60.7	06.0	121	120.4	11.9	181	180.1	17.7	241	239.8	23.6
2	02.0	00.2	62	61.7	06.1	122	121.4	12.0	182	181.1	17.8	242	240.8	23.7
3	03.0	00.3	63	62 7	06.2	123	122.4	12.1	183	182.1	17 9	243	241.8	23.8
4	04.0	00.4	64	63.7	06.3	124	123.4	12.2	184	183.1	18.0	244	242.8	23.9
5	05.0	00.5	65	64.7	06.4	125	124.4	12.3	185	184.1	18.1	245	243.8	24.0
6	06.0	00.6	66	65.7	06.5	126	125.4	12.3	186	185.1	18.2	246	244.8	24.1
7	07.0	00.7	67	66.7	06.6	127	126.4	12.4	187	186.1	18.3	247	245.8	24.2
8	08.0	00.8	68	67.7	06.7	128	127.4	12.5	188	187.1	18.4	248	246.8	24.3
9	09.0	00.9	69	68 7	06.8	129	128.4	12.6	189	188.1	18.5	249	247.8	24.4
10	10.0	01.0	70	69.7	06.9	130	129.4	12.7	190	189.1	18.6	250	248.8	24.5
11	10.9	01.1	71	70.7	07.0	131	130.4	12.8	191	190.1	18.7	251	249.8	24.6
12	11.9	01.2	72	71.7	07.1	132	131.4	12.9	192	191.1	18.8	252	250.8	24.7
13	12.9	01.3	73	72.7	07.2	133	132.4	13.0	193	192.1	18.9	253	251.8	24.8
14	13.9	01.4	74	73.6	07.3	134	133.4	13.1	194	193.1	19.0	254	252.8	24.9
15	14.9	01.5	75	74.6	07.4	135	134.3	13.2	195	194.1	19.1	255	253.8	25.0
16	15.9	01.6	76	75.6	07.4	136	135.3	13.3	196	195.1	19.2	256	254.8	25.1
17	16.9	01.7	77	76.6	07.5	137	136.3	13.4	197	196.1	19.3	257	255.8	25.2
18	17.9	01.8	78	77.6	07.6	138	137.3	13.5	198	197.0	19.4	258	256.8	25.3
19	18.9	01.9	79	78.6	07.7	139	138.3	13.6	199	198.0	19.5	259	257.8	25.4
20	19.9	02.0	80	79.6	07.8	140	139.3	13.7	200	199.0	19.6	260	258.7	25.5
21	20.9	02.1	81	80.6	07.9	141	140.3	13.8	201	200.0	19.7	261	259.7	25.6
22	21.9	02.2	82	81.6	08.0	142	141.3	13.9	202	201.0	19.8	262	260.7	25.7
23	22.9	02.3	83	82.6	08.1	143	142.3	14.0	203	202.0	19.9	263	261.7	25.8
24	23.9	02.4	84	83.6	08.2	144	143.3	14.1	204	203.0	20.0	264	262.7	25.9
25	24.9	02.4	85	84.6	08.3	145	144.3	14.2	205	204.0	20.1	265	263.7	26.0
26	25.9	02 5	86	85.6	08.4	146	145.3	14.3	206	205.0	20.2	266	264.7	26.1
27	26.9	02.6	87	86.6	08.5	147	146.3	14.4	207	206.0	20.3	267	265.7	26.2
28	27.9	02.7	88	87.6	08.6	148	147.3	14.5	208	207.0	20.4	268	266.7	26.3
29	28.9	02.8	89	88.6	08.7	149	148.3	14.6	209	208.0	20.5	269	267.7	26.4
30	29.9	02.9	90	89.6	08.8	150	149.3	14.7	210	209.0	20.6	270	268.7	26.5
31	30.9	03.0	91	90.6	08.9	151	150.3	14.8	211	210.0	20.7	271	269.7	26.6
32	31.8	03.1	92	91.6	09.0	152	151.3	14.9	212	211.0	20.8	272	270.7	26.7
33	32.8	03.2	93	92.6	09.1	153	152.3	15.0	213	212.0	20.9	273	271.7	26.8
34	33.8	03.3	94	93.6	09.2	154	153.3	15.1	214	213.0	21.0	274	272.7	26.9
35	34.8	03.4	95	94.5	09.3	155	154.3	15.2	215	214.0	21.1	275	273.7	27.0
36	35.8	03.5	96	95.5	09.4	156	155.2	15.3	216	215.0	21.2	276	274.7	27.1
37	36.8	03.6	97	96.5	09.5	157	156.2	15.4	217	216.0	21.3	277	275.7	27.2
38	37.8	03.7	98	97.5	09.6	158	157.2	15.5	218	216.9	21.4	278	276.7	27.3
39	38.8	03.8	99	98.5	09.7	159	158.2	15.6	219	217.9	21.5	279	277.7	27.3
40	39.8	03.9	100	99.5	09.8	160	159.2	15.7	220	218.9	21.6	280	278.7	27.4
41	40.8	04.0	101	100.5	09.9	161	160.2	15.8	221	219.9	21 7	281	279.6	27.5
42	41.8	04.1	102	101.5	10.0	162	161.2	15.9	222	220.9	21.8	282	280.6	27.6
43	42.8	04.2	103	102.5	10.1	163	162.2	16.0	223	221.9	21.9	283	281.6	27.7
44	43.8	04.3	104	103.5	10.2	164	163.2	16.1	224	222.9	22.0	284	282.6	27.8
45	44.8	04.4	105	104.5	10.3	165	164.2	16.2	225	223.9	22.1	285	283.6	27.9
46	45.8	04.5	106	105.5	10.4	166	165.2	16.3	226	224.9	22.2	286	284.6	28.0
47	46.8	04.6	107	106.5	10.5	167	166.2	16.4	227	225.9	22.2	287	285.6	28.1
48	47.8	04.7	108	107.5	10.6	168	167.2	16.5	228	226.9	22.3	288	286.6	28.2
49	48.8	04.8	109	108.5	10.7	169	168.2	16.6	229	227.9	22.4	289	287.6	28.3
50	49.8	04.9	110	109.5	10.8	170	169.2	16.7	230	228.9	22.5	290	288.6	28.4
51	50.8	05.0	111	110.5	10.9	171	170.2	16.8	231	229.9	22.6	291	289.6	28.5
52	51.7	05.1	112	111.5	11.0	172	171.2	16.9	232	230.9	22.7	292	290.6	28.6
53	52.7	05.2	113	112.5	11.1	173	172.2	17.0	233	231.9	22.8	293	291 6	28.7
54	53.7	05.3	114	113.5	11.2	174	173.2	17.1	234	232.9	22.9	294	292.6	28.8
55	54.7	05.4	115	114.5	11.3	175	174.2	17.2	235	233.9	23.0	295	293.6	28.9
56	55.7	05.5	116	115.4	11.4	176	175.2	17.3	236	234.9	23.1	296	294.6	29.0
57	56.7	05.6	117	116.4	11.5	177	176.1	17.4	237	235.9	23.2	297	295.6	29.1
58	57.7	05.7	118	117.4	11.6	178	177.1	17.4	238	236.9	23.3	298	296.6	29.2
59	58.7	05.8	119	118.4	11.7	179	178.1	17.5	239	237.8	23.4	299	297.6	29.3
60	59.7	05.9	120	119.4	11.8	180	179.1	17.6	240	238.8	23.5	300	298.6	29.4
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for ¾ Point.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.1	61	60.3	08.9	121	119.7	17.7	181	179.0	26.6	241	238.4	35.4
2	02.0	00.3	62	61.3	09.1	122	120.7	17.9	182	180.0	26.7	242	239.4	35.5
3	03.0	00.4	63	62.3	09.2	123	121.7	18.0	183	181.0	26.8	243	240.4	35.7
4	04.0	00.6	64	63.3	09.4	124	122.7	18.2	184	182.0	27.0	244	241.4	35.8
5	04.9	00.7	65	64.3	09.5	125	123.6	18.3	185	183.0	27.1	245	242.3	35.9
6	05.9	00.9	66	65.3	09.7	126	124.6	18.5	186	184.0	27.3	246	243.3	36.1
7	06.9	01.0	67	66.3	09.8	127	125.6	18.6	187	185.0	27.4	247	244.3	36.2
8	07.9	01.2	68	67.3	10.0	128	126.6	18.8	188	186.0	27.6	248	245.3	36.4
9	08.9	01.3	69	68.2	10.1	129	127.6	18.9	189	186.9	27.7	249	246.3	36.5
10	09.9	01.5	70	69.2	10.3	130	128.6	19.1	190	187.9	27.9	250	247.3	36.7
11	10.9	01.6	71	70.2	10.4	131	129.6	19 2	191	188.9	28.0	251	248.3	36.8
12	11.9	01.8	72	71.2	10.6	132	130.6	19.4	192	189.9	28.2	252	249.3	37.0
13	12.9	01.9	73	72.2	10.7	133	131.6	19.5	193	190.9	28.3	253	250.3	37.1
14	13.8	02.1	74	73.2	10.9	134	132.5	19.7	194	191.9	28.5	254	251.2	37.3
15	14.8	02.2	75	74.2	11.0	135	133.5	19.8	195	192.9	28.6	255	252.2	37.4
16	15.8	02.3	76	75.2	11.1	136	134.5	20.0	196	193.9	28.8	256	253.2	37.6
17	16.8	02.5	77	76.2	11.3	137	135.5	20.1	197	194.9	28.9	257	254.2	37.7
18	17.8	02.6	78	77.2	11.4	138	136.5	20.2	198	195.9	29.0	258	255.2	37.9
19	18.8	02.8	79	78.1	11.6	139	137.5	20.4	199	196.8	29.2	259	256.2	38.0
20	19.8	02.9	80	79.1	11.7	140	138.5	20.5	200	197.8	29.3	260	257.2	38.1
21	20.8	03.1	81	80.1	11.9	141	139.5	20.7	201	198.8	29.5	261	258.2	38.3
22	21.8	03.2	82	81.1	12.0	142	140.5	20.8	202	199.8	29.6	262	259.2	38.4
23	22.7	03.4	83	82.1	12.2	143	141.4	21.0	203	200.8	29.8	263	260.1	38.6
24	23.7	03.5	84	83.1	12.3	144	142.4	21.1	204	201.8	29.9	264	261.1	38.7
25	24.7	03.7	85	84.1	12.5	145	143.4	21.3	205	202.8	30.1	265	262.1	38.9
26	25.7	03.8	86	85.1	12.6	146	144.4	21.4	206	203.8	30.2	266	263.1	39 0
27	26.7	04.0	87	86.1	12.8	147	145.4	21.6	207	204.8	30.4	267	264.1	39.2
28	27.7	04.1	88	87.0	12.9	148	146.4	21.7	208	205.7	30.5	268	265.1	39.3
29	28.7	04.3	89	88.0	13.1	149	147.4	21.9	209	206.7	30.7	269	266.1	39.5
30	29.7	04.4	90	89.0	13.2	150	148.4	22.0	210	207.7	30.8	270	267.1	39.6
31	30.7	04.5	91	90.0	13.3	151	149.4	22.2	211	208.7	30.9	271	268.1	39.8
32	31.7	04.7	92	91.0	13.5	152	150.3	22.3	212	209.7	31.1	272	269.0	39.9
33	32.6	04.8	93	92.0	13.6	153	151.3	22.4	213	210.7	31.2	273	270.0	40.1
34	33.6	05.0	94	93.0	13.8	154	152.3	22.6	214	211.7	31.4	274	271.0	40.2
35	34.6	05.1	95	94.0	13.9	155	153.3	22.7	215	212.7	31.5	275	272.0	40.3
36	35.6	05.3	96	95.0	14.1	156	154.3	22.9	216	213.7	31.7	276	273.0	40.5
37	36.6	05.4	97	95.9	14.2	157	155.3	23.0	217	214.6	31.8	277	274.0	40.6
38	37.6	05.6	98	96.9	14.4	1 8	156.3	23.2	218	215.6	32.0	278	275.0	40.8
39	38.6	05.7	99	97.9	14.5	159	157.3	23.3	219	216.6	32.1	279	276.0	40.9
40	39.6	05.9	100	98.9	14.7	160	158.3	23.5	220	217.6	32.3	280	277.0	41.1
41	40.6	06.0	101	99.9	14.8	161	159.3	23.6	221	218.6	32.4	281	278.0	41.2
42	41.5	06.2	102	100.9	15.0	162	160.2	23.8	222	219.6	32.6	282	278.9	41.4
43	42.5	06.3	103	101.9	15.1	163	161.2	23.9	223	220.6	32.7	283	279 9	41.5
44	43.5	06.5	104	102.9	15.3	164	162.2	24.1	224	221.6	32.9	284	280.9	41.7
45	44.5	06.6	105	103.9	15.4	165	163.2	24.2	225	222.6	33.0	285	281.9	41.8
46	45.5	06.7	106	104.8	15.5	166	164.2	24.4	226	223.5	33.2	286	282.9	42.0
47	46.5	06.9	107	105.8	15.7	167	165.2	24.5	227	224.5	33.3	287	283.9	42.1
48	47.5	07.0	108	106.8	15.8	168	166.2	24.6	228	225.5	33.4	288	284.9	42.3
49	48.5	07.2	109	107.8	16.0	169	167.2	24.8	229	226.5	33.6	289	285.9	42.4
50	49.5	07.3	110	108.8	16.1	170	168.2	24.9	230	227.5	33.7	290	286.9	42.5
51	50.4	07.5	111	109.8	16.3	171	169.1	25.1	231	228.5	33.9	291	287 8	42.7
52	51.4	07.6	112	110.8	16.4	172	170.1	25.2	232	229.5	34 0	292	288.8	42.8
53	52.4	07.8	113	111.8	16.6	173	171.1	25.4	233	230.5	34.2	293	289.8	43.0
54	53.4	07.9	114	112.8	16.7	174	172.1	25.5	234	231.5	34.3	294	290.8	43.1
55	54.4	08.1	115	113.7	16.9	175	173.1	25.7	235	232.4	34.5	295	291.8	43.3
56	55.4	08.2	116	114.7	17.0	176	174.1	25.8	236	233.4	34.6	296	292.8	43.4
57	56.4	08.4	117	115.7	17.2	177	175.1	26.0	237	234.4	34.8	297	293.8	43.6
58	57.4	08.5	118	116.7	17.3	178	176.1	26.1	238	235.4	34.9	298	294.8	43.7
59	58.4	08.7	119	117.7	17.5	179	177.1	26.3	239	236.4	35.1	299	295.8	43.9
60	59.3	08.8	120	118.7	17 6	180	178.0	26.4	240	237.4	35.2	300	296.8	44.0
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE I.

Difference of Latitude and Departure for 1 Point.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.2	61	59.8	11.9	121	118.7	23.6	181	177.5	35.3	241	236.4	47.0
2	02.0	00.4	62	60.8	12.1	122	119.7	23.8	182	178.5	35.5	242	237.3	47.2
3	02.9	00.6	63	61.8	12.3	123	120.6	24.0	183	179.5	35.7	243	238.3	47.4
4	03.9	00.8	64	62.8	12.5	124	121.6	24.2	184	180.5	35.9	244	239.3	47.6
5	04.9	01.0	65	63.7	12.7	125	122.6	24.4	185	181.4	36.1	245	240.3	47.8
6	05.9	01.2	66	64.7	12.9	126	123.6	24.6	186	182.4	36.3	246	241.3	48.0
7	06.9	01.4	67	65.7	13.1	127	124.6	24.8	187	183.4	36.5	247	242.3	48.2
8	07.8	01.6	68	66.7	13.3	128	125.5	25.0	188	184.4	36.7	248	243.2	48.4
9	08.8	01.8	69	67.7	13.5	129	126.5	25.2	189	185.4	36.9	249	244.2	48.6
10	09.8	02.0	70	68.7	13.7	130	127.5	25.4	190	186.3	37.1	250	245.2	48.8
11	10.8	02.1	71	69.6	13.9	131	128.5	25.6	191	187.3	37.3	251	246.2	49.0
12	11.8	02.3	72	70.6	14.0	132	129.5	25.8	192	188.3	37.5	252	247.2	49.2
13	12.7	02.5	73	71.6	14.2	133	130.4	26.0	193	189.3	37.7	253	248.1	49.4
14	13.7	02.7	74	72.6	14.4	134	131.4	26.1	194	190.3	37.8	254	249.1	49.6
15	14.7	02.9	75	73.6	14.6	135	132.4	26.3	195	191.2	38.0	255	250.1	49.7
16	15.7	03.1	76	74.5	14.8	136	133.4	26.5	196	192.2	38.2	256	251.1	49.9
17	16.7	03.3	77	75.5	15.0	137	134.4	26.7	197	193.2	38.4	257	252.1	50.1
18	17.7	03.5	78	76.5	15.2	138	135.3	26.9	198	194.2	38.6	258	253.0	50.3
19	18.6	03.7	79	77.5	15.4	139	136.3	27.1	199	195.2	38.8	259	254.0	50.5
20	19.6	03.9	80	78.5	15.6	140	137.3	27.3	200	196.2	39.0	260	255.0	50.7
21	20.6	04.1	81	79.4	15.8	141	138.3	27.5	201	197.1	39.2	261	256.0	50.9
22	21.6	04.3	82	80.4	16.0	142	139.3	27.7	202	198.1	39.4	262	257.0	51.1
23	22.6	04.5	83	81.4	16.2	143	140.2	27.9	203	199.1	39.6	263	257.9	51.3
24	23.5	04.7	84	82.4	16.4	144	141.2	28.1	204	200.1	39.8	264	258.9	51.5
25	24.5	04.9	85	83.4	16.6	145	142.2	28.3	205	201.1	40.0	265	259.9	51.7
26	25.5	05.1	86	84.3	16.8	146	143.2	28.5	206	202.0	40.2	266	260.9	51.9
27	26.5	05.3	87	85.3	17.0	147	144.2	28.7	207	203.0	40.4	267	261.9	52.1
28	27.5	05.5	88	86.3	17.2	148	145.2	28.9	208	204.0	40.6	268	262.8	52.3
29	28.4	05.7	89	87.3	17.4	149	146.1	29.1	209	205.0	40.8	269	263.8	52.5
30	29.4	05.9	90	88.3	17.6	150	147.1	29.3	210	206.0	41.0	270	264.8	52.7
31	30.4	06.0	91	89.2	17.8	151	148.1	29.5	211	206.9	41.2	271	265.8	52.9
32	31.4	06.2	92	90.2	18.0	152	149.1	29.7	212	207.9	41.4	272	266.8	53.1
33	32.4	06.4	93	91.2	18.1	153	150.1	29.9	213	208.9	41.6	273	267.8	53.3
34	33.3	06.6	94	92.2	18.3	154	151.0	30.0	214	209.9	41.7	274	268.7	53.5
35	34.3	06.8	95	93.2	18.5	155	152.0	30.2	215	210.9	41.9	275	269.7	53.6
36	35.3	07.0	96	94.2	18.7	156	153.0	30.4	216	211.8	42.1	276	270.7	53.8
37	36.3	07.2	97	95.1	18.9	157	154.0	30.6	217	212.8	42.3	277	271.7	54.0
38	37.3	07.4	98	96.1	19.1	158	155.0	30.8	218	213.8	42.5	278	272.7	54.2
39	38.2	07.6	99	97.1	19.3	159	155.9	31.0	219	214.8	42.7	279	273.6	54.4
40	39.2	07.8	100	98.1	19.5	160	156.9	31.2	220	215.8	42.9	280	274.6	54.6
41	40.2	08.0	101	99.1	19.7	161	157.9	31.4	221	216.7	43.1	281	275.6	54.8
42	41.2	08.2	102	100.0	19.9	162	158.9	31.6	222	217.7	43.3	282	276.6	55.0
43	42.2	08.4	103	101.0	20.1	163	159.9	31.8	223	218.7	43.5	283	277.6	55.2
44	43.2	08.6	104	102.0	20.3	164	160.8	32.0	224	219.7	43.7	284	278.5	55.4
45	44.1	08.8	105	103.0	20.5	165	161.8	32.2	225	220.7	43.9	285	279.5	55.6
46	45.1	09.0	106	104.0	20.7	166	162.8	32.4	226	221.7	44.1	286	280.5	55.8
47	46.1	09.2	107	104.9	20.9	167	163.8	32.6	227	222.6	44.3	287	281.5	56.0
48	47.1	09.4	108	105.9	21.1	168	164.8	32.8	228	223.6	44.5	288	282.5	56.2
49	48.1	09.6	109	106.9	21.3	169	165.7	33.0	229	224.6	44.7	289	283.4	56.4
50	49.0	09.8	110	107.9	21.5	170	166.7	33.2	230	225.6	44.9	290	284.4	56.6
51	50.0	10.0	111	108.9	21.7	171	167.7	33.4	231	226.6	45.1	291	285.4	56.8
52	51.0	10.1	112	109.8	21.9	172	168.7	33.6	232	227.5	45.3	292	286.4	57.0
53	52.0	10.3	113	110.8	22.0	173	169.7	33.8	233	228.5	45.5	293	287.4	57.2
54	53.0	10.5	114	111.8	22.2	174	170.7	34.0	234	229.5	45.7	294	288.3	57.4
55	53.9	10.7	115	112.8	22.4	175	171.6	34.1	235	230.5	45.8	295	289.3	57.6
56	54.9	10.9	116	113.8	22.6	176	172.6	34.3	236	231.5	46.0	296	290.3	57.7
57	55.9	11.1	117	114.7	22.8	177	173.6	34.5	237	232.4	46.2	297	291.3	57.9
58	56.9	11.3	118	115.7	23.0	178	174.6	34.7	238	233.4	46.4	298	292.3	58.1
59	57.9	11.5	119	116.7	23.2	179	175.6	34.9	239	234.4	46.6	299	293.3	58.3
60	58.8	11.7	120	117.7	23.4	180	176.5	35.1	240	235.4	46.8	300	294.2	58.5
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 1 ¼ Point.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.2	61	59.2	14.8	121	117.4	29.4	181	175.6	44.0	241	233.8	58.6
2	01.9	00.5	62	60.1	15.1	122	118.3	29.6	182	176.5	44.2	242	234.7	58.8
3	02.9	00.7	63	61.1	15.3	123	119.3	29.9	183	177.5	44.5	243	235.7	59.0
4	03.9	01.0	64	62.1	15.6	124	120.3	30.1	184	178.5	44.7	244	236.7	59.3
5	04.9	01.2	65	63.1	15.8	125	121.3	30.4	185	179.5	45.0	245	237.7	59.5
6	05.8	01.5	66	64.0	16.0	126	122.2	30.6	186	180.4	45.2	246	238.6	59.8
7	06.8	01.7	67	65.0	16.3	127	123.2	30.9	187	181.4	45.4	247	239.6	60.0
8	07.8	01.9	68	66.0	16.5	128	124.2	31.1	188	182.4	45.7	248	240.6	60.3
9	08.7	02.2	69	66.9	16.8	129	125.1	31.3	189	183.3	45.9	249	241.5	60.5
10	09.7	02.4	70	67.9	17.0	130	126.1	31.6	190	184.3	46.2	250	242.5	60.7
11	10.7	02.7	71	68.9	17.3	131	127.1	31.8	191	185.3	46.4	251	243.5	61.0
12	11.6	02.9	72	69.8	17.5	132	128.0	32.1	192	186.2	46.7	252	244.5	61.2
13	12.6	03.2	73	70.8	17.7	133	129.0	32.3	193	187.2	46.9	253	245.4	61.5
14	13.6	03.4	74	71.8	18.0	134	130.0	32.6	194	188.2	47.1	254	246.4	61.7
15	14.6	03.6	75	72.8	18.2	135	131.0	32.8	195	189.2	47.4	255	247.4	62.0
16	15.5	03.9	76	73.7	18.5	136	131.9	33.0	196	190.1	47.6	256	248.3	62.2
17	16.5	04.1	77	74.7	18.7	137	132.9	33.3	197	191 1	47.9	257	249.3	62.5
18	17.5	04.4	78	75.7	19.0	138	133.9	33.5	198	192.1	48.1	258	250.3	62.7
19	18.4	04.6	79	76.6	19.2	139	134.8	33.8	199	193.0	48.4	259	251.2	62.9
20	19.4	04.9	80	77.6	19.4	140	135.8	34.0	200	194.0	48.6	260	252.2	63.2
21	20.4	05.1	81	78.6	19.7	141	136.8	34.3	201	195.0	48.8	261	253.2	63.4
22	21.3	05.3	82	79.5	19.9	142	137.7	34.5	202	195.9	49.1	262	254.2	63.7
23	22.3	05.6	83	80.5	20.2	143	138.7	34.7	203	196.9	49.3	263	255.1	63.9
24	23.3	05.8	84	81.5	20.4	144	139.7	35.0	204	197.9	49.6	264	256.1	64.2
25	24.3	06.1	85	82.5	20.7	145	140.7	35.2	205	198.9	49.8	265	257.1	64.4
26	25.2	06.3	86	83.4	20.9	146	141.6	35.5	206	199.8	50.1	266	258.0	64.6
27	26.2	06.6	87	84.4	21.1	147	142.6	35.7	207	200.8	50.3	267	259.0	64.9
28	27.2	06.8	88	85.4	21.4	148	143.6	36.0	208	201.8	50.5	268	260.0	65.1
29	28.1	07.0	89	86.3	21.6	149	144.5	36.2	209	202.7	50.8	269	260.9	65.4
30	29.1	07.3	90	87.3	21.9	150	145.5	36.5	210	203.7	51.0	270	261.9	65.6
31	30.1	07.5	91	88.3	22.1	151	146.5	36.7	211	204.7	51.3	271	262.9	65.9
32	31.0	07.8	92	89.2	22.4	152	147.4	36.9	212	205.6	51.5	272	263.9	66.1
33	32.0	08.0	93	90.2	22.6	153	148.4	37.2	213	206.6	51.8	273	264.8	66.3
34	33.0	08.3	94	91.2	22.8	154	149.4	37.4	214	207.6	52.0	274	265.8	66.6
35	34.0	08.5	95	92.2	23.1	155	150.4	37.7	215	208.6	52.2	275	266.8	66.8
36	34.9	08.7	96	93.1	23.3	156	151.3	37.9	216	209.5	52.5	276	267.7	67.1
37	35.9	09.0	97	94.1	23.6	157	152.3	38.2	217	210.5	52.7	277	268.7	67.3
38	36.9	09.2	98	95.1	23.8	158	153.3	38.4	218	211.5	53.0	278	269.7	67.6
39	37.8	09.5	99	96.0	24.1	159	154.2	38.6	219	212.4	53.2	279	270.6	67.8
40	38.8	09.7	100	97.0	24.3	160	155.2	38.9	220	213.4	53.5	280	271.6	68.0
41	39.8	10.0	101	98.0	24.5	161	156.2	39.1	221	214.4	53.7	281	272.6	68.3
42	40.7	10.2	102	98.9	24.8	162	157.1	39.4	222	215.4	53.9	282	273.6	68.5
43	41.7	10.4	103	99.9	25.0	163	158.1	39.6	223	216.3	54.2	283	274.5	68.8
44	42.7	10.7	104	100.9	25.3	164	159.1	39.9	224	217.3	54.4	284	275.5	69.0
45	43.7	10.9	105	101.9	25.5	165	160.1	40.1	225	218.3	54.7	285	276.5	69.3
46	44.6	11.2	106	102.8	25.8	166	161.0	40.3	226	219.2	54.9	286	277.4	69.5
47	45.6	11.4	107	103.8	26.0	167	162.0	40.6	227	220.2	55.2	287	278.4	69.7
48	46.6	11.7	108	104.8	26.2	168	163.0	40.8	228	221.2	55.4	288	279.4	70.0
49	47.5	11.9	109	105.7	26.5	169	163.9	41.1	229	222.1	55.6	289	280.3	70.2
50	48.5	12.2	110	106.7	26.7	170	164.9	41.3	230	223.1	55.9	290	281.3	70.5
51	49.5	12.4	111	107.7	27.0	171	165.9	41.6	231	224.1	56.1	291	282.3	70.7
52	50.4	12.6	112	108.6	27.2	172	166.8	41.8	232	225.1	56.4	292	283.3	71.0
53	51.4	12.9	113	109.6	27.5	173	167.8	42.0	233	226.0	56.6	293	284.2	71.2
54	52.4	13.1	114	110.6	27.7	174	168.8	42.3	234	227.0	56.9	294	285.2	71.4
55	53.4	13.4	115	111.6	27.9	175	169.8	42.5	235	228.0	57.1	295	286.2	71.7
56	54.3	13.6	116	112.5	28.2	176	170.7	42.8	236	228.9	57.3	296	287.1	71.9
57	55.3	13.9	117	113.5	28.4	177	171.7	43.0	237	229.9	57.6	297	288.1	72.2
58	56.3	14.1	118	114.5	28.7	178	172.7	43.3	238	230.9	57.8	298	289.1	72.4
59	57.2	14.3	119	115.4	28.9	179	173.6	43.5	239	231.8	58.1	299	290.0	72.7
60	58.2	14.6	120	116.4	29.2	180	174.6	43.7	240	232.8	58.3	300	291.0	72.9
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE I.

Difference of Latitude and Departure for 1 ½ Point.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.3	61	58.4	17.7	121	115.8	35.1	181	173.2	52.5	241	230.6	70.0
2	01.9	00.6	62	59.3	18.0	122	116.8	35.4	182	174.2	52.8	242	231.6	70.2
3	02.9	00.9	63	60.3	18.3	123	117.7	35.7	183	175.1	53.1	243	232.5	70.5
4	03.8	01.2	64	61.2	18.6	124	118.7	36.0	184	176.1	53.4	244	233.5	70.8
5	04.8	01.5	65	62.2	18.9	125	119.6	36.3	185	177.0	53.7	245	234.5	71.1
6	05.7	01.7	66	63.2	19.2	126	120.6	36.6	186	178.0	54.0	246	235.4	71.4
7	06.7	02.0	67	64.1	19.4	127	121.5	36.9	187	179.0	54.3	247	236.4	71.7
8	07.7	02.3	68	65.1	19.7	128	122.5	37.2	188	179.9	54.6	248	237.3	72.0
9	08.6	02.6	69	66 0	20.0	129	123.5	37.4	189	180.9	54.9	249	238.3	72.3
10	09.6	02.9	70	67.0	20.3	130	124.4	37.7	190	181.8	55.1	250	239 2	72.6
11	10.5	03.2	71	67.9	20.6	131	125.4	38.0	191	182.8	55.4	251	240.2	72.9
12	11.5	03.5	72	68.9	20.9	132	126.3	38.3	192	183.7	55.7	252	241.2	73.1
13	12.4	03.8	73	69.9	21.2	133	127.3	38.6	193	184.7	56.0	253	242.1	73.4
14	13.4	04.1	74	70.8	21.5	134	128.2	38.9	194	185.7	56.3	254	243.1	73.7
15	14.4	04.4	75	71.8	21.8	135	129.2	39.2	195	186.6	56.6	255	244.0	74.0
16	15.3	04.6	76	72.7	22.1	136	130.1	39.5	196	187.6	56.9	256	245.0	74.3
17	16.3	04.9	77	73.7	22.3	137	131.1	39.8	197	188.5	57.2	257	245.9	74.6
18	17.2	05.2	78	74.6	22.6	138	132.1	40.1	198	189.5	57.5	258	246.9	74.9
19	18.2	05.5	79	75.6	22.9	139	133.0	40.3	199	190.4	57.8	259	247.9	75.2
20	19.1	05.8	80	76.6	23.2	140	134.0	40.6	200	191.4	58.1	260	248.8	75.5
21	20.1	06.1	81	77.5	23.5	141	134.9	40.9	201	192.3	58.4	261	249.8	75.8
22	21.1	06.4	82	78.5	23.8	142	135.9	41 2	202	193.3	58.6	262	250.7	76.0
23	22.0	06.7	83	79.4	24.1	143	136.8	41.5	203	194.3	58.9	263	251.7	76.3
24	23.0	07 0	84	80.4	24.4	144	137.8	41.8	204	195.2	59.2	264	252.6	76.6
25	23.9	07.3	85	81.3	24.7	145	138.8	42.1	205	196.2	59.5	265	253.6	76.9
26	24.9	07.5	86	82.3	25.0	146	139.7	42.4	206	197.1	59.8	266	254.6	77.2
27	25.8	07.8	87	83.3	25.2	147	140.7	42.7	207	198.1	60.1	267	255.5	77.5
28	26.8	08.1	88	84.2	25.5	148	141.6	43.0	208	199.0	60.4	268	256.5	77.8
29	27.8	08.4	89	85.2	25.8	149	142.6	43.2	209	200.0	60.7	269	257.4	78.1
30	28.7	08.7	90	86.1	26.1	150	143.5	43.5	210	201.0	61.0	270	258.4	78.4
31	29.7	09.0	91	87.1	26.4	151	144.5	43.8	211	201.9	61.2	271	259.3	78.7
32	30.6	09.3	92	88.0	26.7	152	145.5	44.1	212	202.9	61.5	272	260.3	79.0
33	31.6	09.6	93	89.0	27.0	153	146.4	44.4	213	203.8	61.8	273	261.2	79.2
34	32.5	09.9	94	90.0	27.3	154	147.4	44.7	214	204.8	62.1	274	262.2	79.5
35	33.5	10.2	95	90.9	27.6	155	148.3	45.0	215	205.7	62.4	275	263.2	79.8
36	34.5	10.4	96	91.9	27.9	156	149.3	45.3	216	206.7	62.7	276	264.1	80.1
37	35.4	10.7	97	92.8	28.2	157	150.2	45.6	217	207.7	63.0	277	265.1	80.4
38	36.4	11.0	98	93.8	28.4	158	151.2	45.9	218	208.6	63.3	278	266.0	80.7
39	37.3	11.3	99	94.7	28.7	159	152.2	46.1	219	209.6	63.6	279	267.0	81.0
40	38.3	11.6	100	95.7	29.0	160	153.1	46.4	220	210.5	63.9	280	267.9	81.3
41	39.2	11.9	101	96.7	29.3	161	154.1	46.7	221	211.5	64.1	281	268.9	81.6
42	40.2	12.2	102	97.6	29.6	162	155.0	47.0	222	212.4	64.4	282	269.9	81.9
43	41.2	12.5	103	98.6	29.9	163	156.0	47.3	223	213.4	64.7	283	270.8	82.1
44	42.1	12.8	104	99.5	30.2	164	156.9	47.6	224	214.4	65.0	284	271.8	82.4
45	43.1	13.1	105	100.5	30.5	165	157.9	47.9	225	215.3	65.3	285	272.7	82.7
46	44.0	13.3	106	101.4	30.8	166	158.9	48.2	226	216.3	65.6	286	273.7	83.0
47	45.0	13.6	107	102.4	31.1	167	159.8	48.5	227	217.2	65.9	287	274.6	83.3
48	45.9	13.9	108	103.4	31.4	168	160.8	48.8	228	218.2	66.2	288	275.6	83.6
49	46.9	14.2	109	104.3	31.6	169	161.7	49.1	229	219.1	66.5	289	276.6	83.9
50	47.9	14.5	110	105.3	31.9	170	162.7	49.3	230	220.1	66.8	290	277.5	84.2
51	48.8	14.8	111	106.2	32.2	171	163.6	49.6	231	221.1	67.0	291	278.5	84.5
52	49.8	15.1	112	107.2	32.5	172	164.6	49.9	232	222.0	67.3	292	279.4	84.8
53	50.7	15.4	113	108.1	32.8	173	165.6	50.2	233	223.0	67.6	293	280.4	85.0
54	51.7	15.7	114	109.1	33 1	174	166.5	50.5	234	223.9	67.9	294	281.3	85.3
55	52.6	16.0	115	110.1	33.4	175	167.5	50.8	235	224.9	68.2	295	282.3	85 6
56	53.6	16.3	116	111.0	33.7	176	168.4	51.1	236	225.8	68.5	296	283.3	85 9
57	54.5	16.5	117	112.0	34.0	177	169.4	51.4	237	226.8	68.8	297	284.2	86.2
58	55.5	16.8	118	112.9	34.2	178	170.3	51.7	238	227.8	69.1	298	285.2	86.5
59	56.5	17.1	119	113.9	34.5	179	171.3	52.0	239	228.7	69.4	299	286.1	86.8
60	57.4	17.4	120	114.8	34.8	180	172.3	52.2	240	229.7	69.7	300	287.1	87.1

Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 1 ¾ Point.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.3	61	57.4	20.5	121	113.9	40.8	181	170.4	61.0	241	226.9	81.2
2	01.9	00.7	62	58.4	20.9	122	114.9	41.1	182	171.4	61.3	242	227.8	81.5
3	02.8	01.0	63	59.3	21.2	123	115.8	41.4	183	172.3	61.6	243	228.8	81.9
4	03.8	01.3	64	60.3	21.6	124	116.7	41.8	184	173.2	62.0	244	229.7	82.2
5	04.7	01.7	65	61.2	21.9	125	117.7	42.1	185	174.2	62.3	245	230.7	82.5
6	05.6	02.0	66	62.1	22.2	126	118.6	42.4	186	175.1	62.7	246	231.6	82.9
7	06.6	02.4	67	63.1	22.6	127	119.6	42.8	187	176.1	63.0	247	232.6	83.2
8	07.5	02.7	68	64.0	22.9	128	120.5	43.1	188	177.0	63.3	248	233.5	83.5
9	08.5	03.0	69	65.0	23.2	129	121.5	43.5	189	177.9	63.7	249	234.4	83.9
10	09.4	03.4	70	65.9	23.6	130	122.4	43.8	190	178.9	64.0	250	235.4	84.2
11	10.4	03.7	71	66.8	23.9	131	123.3	44.1	191	179.8	64.3	251	236.3	84.6
12	11.3	04.0	72	67.8	24.3	132	124.3	44.5	192	180.8	64.7	252	237.3	84.9
13	12.2	04.4	73	68.7	24.6	133	125.2	44.8	193	181.7	65.0	253	238.2	85.2
14	13.2	04.7	74	69.7	24.9	134	126.2	45.1	194	182.7	65.4	254	239.1	85.6
15	14.1	05.1	75	70.6	25.3	135	127.1	45.5	195	183.6	65.7	255	240.1	85.9
16	15.1	05.4	76	71.6	25.6	136	128.0	45.8	196	184.5	66.0	256	241.0	86.2
17	16.0	05.7	77	72.5	25.9	137	129.0	46.1	197	185.5	66.4	257	242.0	86.6
18	17.0	06.1	78	73.4	26.3	138	129.9	46.5	198	186.4	66.7	258	242.9	86.9
19	17.9	06.4	79	74.4	26.6	139	130.9	46.8	199	187.4	67.0	259	243.9	87.2
20	18.8	06.7	80	75.3	26.9	140	131.8	47.2	200	188.3	67.4	260	244.8	87.6
21	19.8	07.1	81	76.3	27.3	141	132.8	47.5	201	189.2	67.7	261	245.7	87.9
22	20.7	07.4	82	77.2	27.6	142	133.7	47.8	202	190.2	68.0	262	246.7	88.3
23	21.7	07.7	83	78.1	28.0	143	134.6	48.2	203	191.1	68.4	263	247.6	88.6
24	22.6	08.1	84	79.1	28.3	144	135.6	48.5	204	192.1	68.7	264	248.6	88.9
25	23.5	08.4	85	80.0	28.6	145	136.5	48.8	205	193.0	69.1	265	249.5	89.3
26	24.5	08.8	86	81.0	29.0	146	137.5	49.2	206	194.0	69.4	266	250.4	89.6
27	25.4	09.1	87	81.9	29.3	147	138.4	49.5	207	194.9	69.7	267	251.4	89.9
28	26.4	09.4	88	82.9	29.6	148	139.3	49.9	208	195.8	70.1	268	252.3	90.3
29	27.3	09.8	89	83.8	30.0	149	140.3	50.2	209	196.8	70.4	269	253.3	90.6
30	28.2	10.1	90	84.7	30.3	150	141.2	50.5	210	197.7	70.7	270	254.2	91.0
31	29.2	10.4	91	85.7	30.7	151	142.2	50.9	211	198.7	71.1	271	255.2	91.3
32	30.1	10.8	92	86.6	31.0	152	143.1	51.2	212	199.6	71.4	272	256.1	91.6
33	31.1	11.1	93	87.6	31.3	153	144.1	51.5	213	200.5	71.8	273	257.0	92.0
34	32.0	11.5	94	88.5	31.7	154	145.0	51.9	214	201.5	72.1	274	258.0	92.3
35	33.0	11.8	95	89.4	32.0	155	145.9	52.2	215	202.4	72.4	275	258.9	92.6
36	33.9	12.1	96	90.4	32.3	156	146.9	52.5	216	203.4	72.8	276	259.9	93.0
37	34.8	12.5	97	91.3	32.7	157	147.8	52.9	217	204.3	73.1	277	260.8	93.3
38	35.8	12.8	98	92.3	33.0	158	148 8	53.2	218	205.3	73.4	278	261.7	93.7
39	36.7	13.1	99	93.2	33.3	159	149.7	53.6	219	206.2	73.8	279	262.7	94.0
40	37.7	13.5	100	94.2	33.7	160	150.6	53.9	220	207.1	74.1	280	263.6	94.3
41	38.6	13.8	101	95.1	34.0	161	151.6	54.2	221	208.1	74.4	281	264.6	94.7
42	39.5	14.1	102	96.0	34.4	162	152.5	54.6	222	209.0	74.8	282	265 5	95.0
43	40.5	14.5	103	97.0	34.7	163	153.5	54.9	223	210.0	75.1	283	266.5	95.3
44	41.4	14.8	104	97.9	35.0	164	154.4	55.2	224	210.9	75.5	284	267.4	95.7
45	42.4	15.2	105	98.9	35.4	165	155.3	55.6	225	211.8	75.8	285	268.3	96.0
46	43.3	15.5	106	99.8	35.7	166	156.3	55.9	226	212.8	76.1	286	269.3	96.3
47	44.3	15.8	107	100.7	36.0	167	157.2	56.3	227	213.7	76.5	287	270.2	96.7
48	45.2	16.2	108	101.7	36.4	168	158.2	56.6	228	214.7	76.8	288	271.2	97.0
49	46.1	16.5	109	102.6	36.7	169	159.1	56.9	229	215.6	77.1	289	272.1	97.4
50	47.1	16.8	110	103.6	37.1	170	160.1	57.3	230	216.5	77.5	290	273.0	97.7
51	48.0	17.2	111	104.5	37.4	171	161.0	57.6	231	217.5	77.8	291	274.0	98.0
52	49.0	17.5	112	105.4	37.7	172	161.9	57.9	232	218.4	78.2	292	274.9	98.4
53	49.9	17.9	113	106.4	38.1	173	162.9	58.3	233	219.4	78.5	293	275.9	98 7
54	50.8	18.2	114	107.3	38.4	174	163.8	58.6	234	220.3	78.8	294	276.8	99.0
55	51.8	18.5	115	108.3	38.7	175	164.8	59.0	235	221.3	79.2	295	277.7	99.4
56	52.7	18.9	116	109.2	39.1	176	165.7	59.3	236	222.2	79.5	296	278.7	99.7
57	53.7	19.2	117	110.2	39.4	177	166.6	59.6	237	223.1	79.8	297	279.6	100.1
58	54.6	19.5	118	111.1	39.7	178	167.6	60.0	238	224.1	80.2	298	280.6	100.4
59	55.5	19.9	119	112.0	40.1	179	168.5	60.3	239	225.0	80.5	299	281.5	100.7
60	56.5	20.2	120	113.0	40.4	180	169.5	60.6	240	226.0	80.8	300	282.5	101.1
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE I.

Difference of Latitude and Departure for 2 Points.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	56.4	23.3	121	111.8	46.3	181	167.2	69.3	241	222.7	92.2
2	01.8	00.8	62	57.3	23.7	122	112.7	46.7	182	168.2	69.7	242	223.6	92 6
3	02.8	01.1	63	58.2	24.1	123	113.6	47 1	183	169.1	70.0	243	224.5	93.0
4	03.7	01.5	64	59.1	24.5	124	114.6	47.5	184	170.0	70.4	244	225.4	93.4
5	04.6	01.9	65	60.1	24.9	125	115.5	47.8	185	170.9	70.8	245	226.4	93.8
6	05.5	02.3	66	61.0	25.3	126	116.4	48.2	186	171.8	71.2	246	227.3	94.1
7	06.5	02.7	67	61.9	25.6	127	117.3	48.6	187	172.8	71.6	247	228.2	94.5
8	07.4	03.1	68	62.8	26.0	128	118.3	49.0	188	173.7	71.9	248	229.1	94.9
9	08.3	03.4	69	63.8	26.4	129	119.2	49.4	189	174.6	72.3	249	230.1	95.3
10	09.2	03.8	70	64.7	26.8	130	120.1	49.8	190	175.5	72.7	250	231.0	95.7
11	10.2	04.2	71	65.6	27.2	131	121.0	50.1	191	176.5	73.1	251	231.9	96.1
12	11.1	04.6	72	66.5	27.6	132	122.0	50.5	192	177.4	73.5	252	232.8	96.4
13	12.0	05.0	73	67.4	27.9	133	122.9	50.9	193	178.3	73.9	253	233.7	96.8
14	12.9	05.4	74	68.4	28.3	134	123.8	51.3	194	179.2	74.2	254	234.7	97.2
15	13.9	05.7	75	69.3	28.7	135	124.7	51.7	195	180.2	74.6	255	235.6	97.6
16	14.8	06.1	76	70.2	29.1	136	125.7	52.0	196	181.1	75.0	256	236.5	98.0
17	15.7	06.5	77	71.1	29.5	137	126.6	52.4	197	182.0	75.4	257	237.4	98.4
18	16.6	06.9	78	72.1	29.9	138	127.5	52.8	198	182.9	75.8	258	238.4	98.7
19	17.6	07.3	79	73.0	30.2	139	128.4	53.2	199	183.9	76.2	259	239.3	99.1
20	18.5	07.7	80	73.9	30.6	140	129.3	53.6	200	184.8	76.5	260	240.2	99.5
21	19.4	08.0	81	74.8	31.0	141	130.3	54.0	201	185.7	76.9	261	241.1	99.9
22	20.3	08 4	82	75.8	31.4	142	131.2	54.3	202	186.6	77.3	262	242.1	100.3
23	21.3	08.8	83	76.7	31.8	143	132.1	54.7	203	187.6	77.7	263	243.0	100.6
24	22.2	09.2	84	77.6	32.1	144	133.0	55.1	204	188.5	78.1	264	243.9	101.0
25	23.1	09.6	85	78.5	32.5	145	134.0	55.5	205	189.4	78.5	265	244.8	101.4
26	24.0	10.0	86	79.5	32.9	146	134.9	55.9	206	190.3	78.8	266	245.8	101.8
27	24.9	10.3	87	80.4	33.3	147	135.8	56.3	207	191.2	79.2	267	246.7	102.2
28	25.9	10.7	88	81.3	33.7	148	136.7	56.6	208	192.2	79.6	268	247.6	102.6
29	26.8	11.1	89	82.2	34.1	149	137.7	57.0	209	193.1	80.0	269	248.5	102.9
30	27.7	11.5	90	83.2	34.4	150	138.6	57.4	210	194.0	80.4	270	249.5	103.3
31	28.6	11.9	91	84.1	34.8	151	139.5	57.8	211	194.9	80.8	271	250.4	103.7
32	29.6	12.2	92	85.0	35.2	152	140.4	58.2	212	195.9	81.1	272	251.3	104.1
33	30.5	12.6	93	85.9	35.6	153	141.4	58.6	213	196.8	81.5	273	252.2	104.5
34	31.4	13.0	94	86.8	36.0	154	142.3	58.9	214	197.7	81.9	274	253.1	104.9
35	32.3	13.4	95	87.8	36.4	155	143.2	59.3	215	198.6	82.3	275	254.1	105.2
36	33.3	13.8	96	88.7	36.7	156	144.1	59.7	216	199.6	82.7	276	255.0	105.6
37	34.2	14.2	97	89.6	37.1	157	145.1	60.1	217	200.5	83.0	277	255.9	106.0
38	35.1	14.5	98	90.5	37.5	158	146.0	60.5	218	201.4	83.4	278	256.8	106.4
39	36.0	14.9	99	91.5	37.9	159	146.9	60.9	219	202.3	83.8	279	257.8	106.8
40	37.0	15.3	100	92.4	38.3	160	147.8	61.2	220	203.3	84.2	280	258.7	107.2
41	37.9	15.7	101	93.3	38.7	161	148.7	61.6	221	204.2	84.6	281	259.6	107.5
42	38.8	16.1	102	94.2	39.0	162	149.7	62.0	222	205.1	85.0	282	260.5	107.9
43	39.7	16.5	103	95.2	39.4	163	150.6	62.4	223	206.0	85.3	283	261.5	108.3
44	40.6	16.8	104	96.1	39.8	164	151.5	62.8	224	207.0	85.7	284	262.4	108.7
45	41.6	17.2	105	97.0	40.2	165	152.4	63.1	225	207.9	86.1	285	263.3	109.1
46	42.5	17.6	106	97.9	40.6	166	153.4	63.5	226	208.8	86.5	286	264.2	109.5
47	43.4	18.0	107	98.9	41.0	167	154.3	63.9	227	209.7	86.9	287	265.2	109.8
48	44.4	18.4	108	99.8	41.3	168	155.2	64.3	228	210.6	87.3	288	266.1	110.2
49	45.3	18.8	109	100.7	41.7	169	156.1	64.7	229	211.6	87.6	289	267.0	110.6
50	46.2	19.1	110	101.6	42.1	170	157.1	65.1	230	212.5	88.0	290	267.9	111.0
51	47.1	19.5	111	102.6	42.5	171	158.0	65.4	231	213.4	88.4	291	268.9	111.4
52	48.0	19.9	112	103.5	42.9	172	158.9	65.8	232	214.3	88.8	292	269.8	111.7
53	49.0	20.3	113	104.4	43.2	173	159.8	66.2	233	215.3	89.2	293	270.7	112.1
54	49.9	20.7	114	105.3	43.6	174	160.8	66.6	234	216.2	89.6	294	271 6	112.5
55	50.8	21.0	115	106.3	44.0	175	161.7	67.0	235	217.1	89.9	295	272 5	112.9
56	51.7	21.4	116	107.2	44.4	176	162.6	67.4	236	218.0	90.3	296	273.5	113.3
57	52.7	21.8	117	108.1	44.8	177	163.5	67.7	237	219.0	90.7	297	274.4	113.7
58	53.6	22.2	118	109.0	45.2	178	164.5	68.1	238	219.9	91.1	298	275.3	114.0
59	54.5	22.6	119	109.9	45.5	179	165.4	68.5	239	220.8	91.5	299	276.2	114.4
60	55.4	23.0	120	110.9	45.9	180	166.3	68.9	240	221.7	91.8	300	277.2	114.8
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 2 ¼ Points.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	55.1	26.1	121	109.4	51.7	181	163.6	77.4	241	217.9	103.0
2	01.8	00.9	62	56.0	26.5	122	110.3	52.2	182	164.5	77.8	242	218.8	103.5
3	02.7	01.3	63	57.0	26.9	123	111.2	52.6	183	165.4	78.3	243	219.7	103.9
4	03.6	01.7	64	57.9	27.4	124	112.1	53.0	184	166.3	78.7	244	220.6	104.3
5	04.5	02.1	65	58.8	27.8	125	113.0	53.5	185	167.2	79.1	245	221.5	104.8
6	05.4	02.6	66	59.7	28.2	126	113.9	53.9	186	168.1	79.5	246	222.4	105.2
7	06.3	03.0	67	60.6	28.6	127	114.8	54.3	187	169.0	80.0	247	223.3	105.6
8	07.2	03.4	68	61.5	29.1	128	115.7	54.7	188	169.9	80.4	248	224.2	106.0
9	08.1	03.8	69	62.4	29.5	129	116.6	55.2	189	170.9	80.8	249	225.1	106.5
10	09.0	04.3	70	63.3	29.9	130	117.5	55.6	190	171.8	81.2	250	226.0	106.9
11	09.9	04.7	71	64.2	30.4	131	118.4	56.0	191	172.7	81.7	251	226.9	107.3
12	10.8	05.1	72	65.1	30.8	132	119.3	56.4	192	173.6	82.1	252	227.8	107.8
13	11.8	05.6	73	66.0	31.2	133	120.2	56.9	193	174.5	82.5	253	228.7	108.2
14	12.7	06.0	74	66.9	31.6	134	121.1	57.3	194	175.4	83.0	254	229.6	108.6
15	13.6	06.4	75	67.8	32.1	135	122.0	57.7	195	176.3	83.4	255	230.5	109.0
13	14.5	06.8	76	68.7	32.5	136	122.9	58.2	196	177.2	83.8	256	231 4	109.5
17	15.4	07.3	77	69.6	32.9	137	123.8	58.6	197	178.1	84.2	257	232.3	109.9
18	16.3	07.7	78	70.5	33.4	138	124.7	59.0	198	179.0	84.7	258	233.2	110.3
19	17.2	08.1	79	71.4	33.8	139	125.7	59.4	199	179.9	85.1	259	234.1	110.7
20	18.1	08.6	80	72.3	34.2	140	126.6	59.9	200	180.8	85.5	260	235.0	111.2
21	19.0	09.0	81	73.2	34.6	141	127.5	60.3	201	181.7	85.9	261	235.9	111.6
22	19.9	09.4	82	74.1	35.1	142	128.4	60.7	202	182.6	86.4	262	236.8	112.0
23	20.8	09.8	83	75.0	35.5	143	129.3	61.2	203	183.5	86.8	263	237.7	112.5
24	21.7	10.3	84	75.9	35.9	144	130.2	61.6	204	184.4	87.2	264	238.7	112.9
25	22.6	10.7	85	76.8	36.3	145	131.1	62.0	205	185.3	87.7	265	239.6	113.3
26	23.5	11.1	86	77.7	36.8	146	132.0	62.4	206	186.2	88.1	266	240.5	113.7
27	24.4	11.5	87	78.6	37.2	147	132.9	62.9	207	187.1	88.5	267	241.4	114.2
28	25.3	12.0	88	79.6	37.6	148	133.8	63.3	208	188.0	88.9	268	242.3	114.6
29	26.2	12.4	89	80.5	38.1	149	134.7	63.7	209	188.9	89.4	269	243.2	115.0
30	27.1	12.8	90	81.4	38.5	150	135.6	64.1	210	189.8	89.8	270	244.1	115.4
31	28.0	13.3	91	82.3	38.9	151	136.5	64.6	211	190.7	90.2	271	245.0	115.9
32	28.9	13.7	92	83.2	39.3	152	137.4	65.0	212	191.6	90.6	272	245.9	116.3
33	29.8	14.1	93	84.1	39.8	153	138.3	65.4	213	192.6	91.1	273	246.8	116.7
34	30.7	14.5	94	85.0	40.2	154	139.2	65.9	214	193.5	91.5	274	247.7	117.2
35	31.6	15.0	95	85.9	40.6	155	140.1	66.3	215	194.4	91.9	275	248.6	117.6
36	32.5	15.4	96	86.8	41.1	156	141.0	66.7	216	195.3	92.4	276	249.5	118.0
37	33.4	15.8	97	87.7	41.5	157	141.9	67.1	217	196.2	92.8	277	250.4	118.4
38	34.4	16.2	98	88.6	41.9	158	142.8	67.6	218	197.1	93.2	278	251.3	118.9
39	35.3	16.7	99	89.5	42.3	159	143.7	68.0	219	198.0	93.6	279	252.2	119.3
40	36.2	17.1	100	90.4	42.8	160	144.6	68.4	220	198.9	94.1	280	253.1	119.7
41	37.1	17.5	101	91.3	43.2	161	145.5	68.8	221	199.8	94.5	281	254.0	120.2
42	38.0	18.0	102	92.2	43.6	162	146.4	69.3	222	200.7	94.9	282	254.9	120.6
43	38.9	18.4	103	93.1	44.0	163	147.3	69.7	223	201.6	95.4	283	255.8	121.0
44	39.8	18.8	104	94.0	44.5	164	148.3	70.1	224	202.5	95.8	284	256.7	121.4
45	40.7	19.2	105	94.9	44.9	165	149.2	70.6	225	203.4	96.2	285	257.6	121.9
46	41.6	19.7	106	95.8	45.3	166	150.1	71.0	226	204.3	96.6	286	258.5	122.3
47	42.5	20.1	107	96.7	45.8	167	151.0	71.4	227	205.2	97.1	287	259.4	122.7
48	43.4	20.5	108	97.6	46.2	168	151.9	71.8	228	206.1	97.5	288	260.3	123.1
49	44.3	21.0	109	98.5	46.6	169	152.8	72.3	229	207.0	97.9	289	261.3	123.6
50	45.2	21.4	110	99.4	47.0	170	153.7	72.7	230	207.9	98.3	290	262.2	124.0
51	46.1	21.8	111	100.3	47.5	171	154.6	73.1	231	208.8	98.8	291	263.1	124.4
52	47.0	22.2	112	101.2	47.9	172	155.5	73.6	232	209.7	99.2	292	264.0	124.9
53	47.9	22.7	113	102.1	48.3	173	156.4	74.0	233	210.6	99.6	293	264.9	125.3
54	48.8	23.1	114	103.1	48.7	174	157.3	74.4	234	211.5	100.1	294	265.8	125.7
55	49.7	23.5	115	104.0	49.2	175	158.2	74.8	235	212.4	100.5	295	266.7	126.1
56	50.6	23.9	116	104.9	49.6	176	159.1	75.3	236	213.3	100.9	296	267.6	126.6
57	51.5	24.4	117	105.8	50.0	177	160.0	75.7	237	214.2	101.3	297	268.5	127.0
58	52.4	24.8	118	106.7	50.5	178	160.9	76.1	238	215.1	101.8	298	269.4	127.4
59	53.3	25.2	119	107.6	50.9	179	161.8	76.5	239	216.1	102.2	299	270.3	127.8
60	54.2	25.7	120	108.5	51.3	180	162.7	77.0	240	217.0	102.6	300	271.2	128.3
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE I.

Difference of Latitude and Departure for 2 ½ Points.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	53.8	28.8	121	106.7	57.0	181	159.6	85.3	241	212.5	113.6
2	01.8	00.9	62	54.7	29.2	122	107.6	57.5	182	160.5	85.8	242	213.4	114.1
3	02.6	01.4	63	55.6	29.7	123	108.5	58.0	183	161.4	86.3	243	214.3	114.6
4	03.5	01.9	64	56.4	30.2	124	109.4	58.4	184	162.3	86.7	244	215.2	115.0
5	04.4	02.4	65	57.3	30.6	125	110.2	58.9	185	163.2	87.2	245	216.1	115.5
6	05.3	02.8	66	58.2	31.1	126	111.1	59.4	186	164.0	87.7	246	217.0	116.0
7	06.2	03.3	67	59.1	31.6	127	112.0	59.9	187	164.9	88.1	247	217.8	116.4
8	07.1	03.8	68	60.0	32.1	128	112.9	60.3	188	165.8	88.6	248	218.7	116.9
9	07.9	04.2	69	60.9	32.5	129	113.8	60.8	189	166.7	89.1	249	219.6	117.4
10	08.8	04.7	70	61.7	33.0	130	114.7	61.3	190	167.6	89.6	250	220.5	117.8
11	09.7	05.2	71	62.6	33.5	131	115.5	61.7	191	168.5	90.0	251	221.4	118.3
12	10.6	05.7	72	63.5	33.9	132	116.4	62.2	192	169.3	90.5	252	222.2	118.8
13	11.5	06.1	73	64.4	34.4	133	117.3	62.7	193	170.2	91.0	253	223.1	119.3
14	12.3	06.6	74	65.3	34.9	134	118.2	63.2	194	171.1	91.4	254	224.0	119.7
15	13.2	07.1	75	66.1	35.4	135	119.1	63.6	195	172.0	91.9	255	224.9	120.2
16	14.1	07.5	76	67.0	35.8	136	119.9	64.1	196	172.9	92 4	256	225.8	120.7
17	15.0	08.0	77	67.9	36.3	137	120.8	64.6	197	173.7	92.9	257	226.7	121.1
18	15.9	08.5	78	68.8	36.8	138	121.7	65.0	198	174.6	93.3	258	227.5	121.6
19	16.8	09.0	79	69.7	37.2	139	122.6	65.5	199	175.5	93.8	259	228.4	122.1
20	17.6	09.4	80	70.6	37.7	140	123.5	66.0	200	176.4	94.3	260	229.3	122.6
21	18.5	09.9	81	71.4	38.2	141	124.4	66.5	201	177.3	94.7	261	230.2	123.0
22	19.4	10.4	82	72.3	38.6	142	125.2	66.9	202	178.2	95.2	262	231.1	123.5
23	20.3	10.8	83	73.2	39.1	143	126.1	67.4	203	179.0	95.7	263	231.9	124.0
24	21.2	11.3	84	74.1	39.6	144	127.0	67.9	204	179.9	96.2	264	232.8	124.4
25	22.1	11.8	85	75.0	40.1	145	127.9	68.3	205	180.8	96.6	265	233.7	124.9
26	22.9	12.3	86	75.9	40.5	146	128.8	68.8	206	181.7	97.1	266	234.6	125.4
27	23.8	12.7	87	76.7	41.0	147	129.6	69.3	207	182.6	97.6	267	235.5	125.9
28	24.7	13.2	88	77.6	41.5	148	130.5	69.8	208	183.4	98.0	268	236.4	126.3
29	25.6	13.7	89	78.5	41.9	149	131.4	70.2	209	184.3	98.5	269	237.2	126.8
30	26.5	14.1	90	79.4	42.4	150	132.3	70.7	210	185.2	99.0	270	238.1	127.3
31	27.3	14.6	91	80.3	42.9	151	133.2	71.2	211	186.1	99.5	271	239.0	127.7
32	28.2	15.1	92	81.1	43.4	152	134.1	71.6	212	187.0	99.9	272	239.9	128.2
33	29.1	15.6	93	82.0	43.8	153	134.9	72.1	213	187.8	100.4	273	240.8	128.7
34	30.0	16.0	94	82.9	44.3	154	135.8	72.6	214	188.7	100.9	274	241.7	129.2
35	30.9	16.5	95	83.8	44.8	155	136.7	73.1	215	189.6	101.3	275	242.5	129.6
36	31.8	17.0	96	84.7	45.2	156	137.6	73.5	216	190.5	101.8	276	243.4	130.1
37	32.6	17.4	97	85.6	45.7	157	138.5	74.0	217	191.4	102.3	277	244.3	130.6
38	33.5	17.9	98	86.4	46.2	158	139.3	74.5	218	192.3	102.8	278	245.2	131.0
39	34.4	18.4	99	87.3	46.7	159	140.2	74.9	219	193.1	103.2	279	246.1	131.5
40	35.3	18.9	100	88.2	47.1	160	141.1	75.4	220	194.0	103.7	280	246.9	132.0
41	36.2	19.3	101	89.1	47.6	161	142.0	75.9	221	194.9	104.2	281	247.8	132.5
42	37.0	19.8	102	90.0	48.1	162	142.9	76.4	222	195.8	104.6	282	248.7	132.9
43	37.9	20.3	103	90.8	48.5	163	143.8	76.8	223	196.7	105.1	283	249.6	133.4
44	38.8	20.7	104	91.7	49.0	164	144.6	77.3	224	197.6	105.6	284	250.5	133.9
45	39.7	21.2	105	92.6	49.5	165	145.5	77.8	225	198.4	106.1	285	251.4	134.3
46	40.6	21.7	106	93.5	50.0	166	146.4	78.2	226	199.3	106.5	286	252.2	134.8
47	41.5	22.2	107	94.4	50.4	167	147.3	78.7	227	200.2	107.0	287	253.1	135.3
48	42.3	22.6	108	95.3	50.9	168	148.2	79.2	228	201.1	107.5	288	254.0	135.8
49	43.2	23.1	109	96.1	51.4	169	149.0	79.7	229	202.0	107.9	289	254.9	136.2
50	44.1	23.6	110	97.0	51.8	170	149.9	80.1	230	202.8	108.4	290	255.8	136.7
51	45.0	24.0	111	97.9	52.3	171	150.8	80.6	231	203.7	108.9	291	256.6	137.2
52	45.9	24.5	112	98.8	52.8	172	151.7	81.1	232	204.6	109.4	292	257.5	137.6
53	46.7	25.0	113	99.7	53.3	173	152.6	81.5	233	205.5	109.8	293	258.4	138.1
54	47.6	25.5	114	100.5	53.7	174	153.5	82.0	234	206.4	110.3	294	259.3	138.6
55	48.5	25.9	115	101.4	54.2	175	154.3	82.5	235	207.3	110.8	295	260.2	139.1
56	49.4	26.4	116	102.3	54.7	176	155.2	83.0	236	208.1	111.2	296	261.1	139.5
57	50.3	26.9	117	103.2	55.1	177	156.1	83.4	237	209.0	111.7	297	261.9	140.0
58	51.2	27.3	118	104.1	55.6	178	157.0	83.9	238	209.9	112.2	298	262.8	140.5
59	52.0	27.8	119	105.0	56.1	179	157.9	84.4	239	210.8	112.7	299	263.7	140.9
60	52.9	28.3	120	105.8	56.6	180	158.8	84 8	240	211.7	113.1	300	264.6	141.4
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 5 ½ Points.

Difference of Latitude and Departure for 2 ¾ Points.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep
1	00.9	00.5	61	52.3	31.4	121	103.8	62.2	181	155.3	93.0	241	206.7	123.9
2	01.7	01.0	62	53.2	31.9	122	104.6	62.7	182	156.1	93.6	242	207.6	124.4
3	02.6	01.5	63	54.0	32.4	123	105.5	63.2	183	157.0	94.1	243	208.4	124.9
4	03.4	02.1	64	54.9	32.9	124	106.4	63.7	184	157.8	94.6	244	209.3	125.4
5	04.3	02.6	65	55.8	33.4	125	107.2	64.3	185	158.7	95.1	245	210.1	125.9
6	05.1	03.1	66	56.6	33.9	126	108.1	64.8	186	159.5	95.6	246	211.0	126.5
7	06.0	03.6	67	57.5	34.4	127	108.9	65.3	187	160.4	96.1	247	211.9	127.0
8	06.9	04.1	68	58.3	35.0	128	109.8	65.8	188	161.2	96.6	248	212.7	127.5
9	07.7	04.6	69	59.2	35.5	129	110.6	66.3	189	162.1	97.2	249	213.6	128.0
10	08.6	05.1	70	60.0	36.0	130	111.5	66.8	190	163.0	97.7	250	214.4	128.5
11	09.4	05.7	71	60.9	36.5	131	112.4	67.3	191	163.8	98.2	251	215.3	129.0
12	10.3	06.2	72	61.8	37.0	132	113.2	67.9	192	164.7	98.7	252	216.1	129.5
13	11.2	06.7	73	62.6	37.5	133	114.1	68.4	193	165.5	99.2	253	217.0	130.1
14	12.0	07.2	74	63.5	38.0	134	114.9	68.9	194	166.4	99.7	254	217.9	130.6
15	12.9	07.7	75	64.3	38.6	135	115.8	69.4	195	167.3	100.2	255	218.7	131.1
16	13.7	08.2	76	65.2	39.1	136	116.6	69.9	196	168.1	100.8	256	219.6	131.6
17	14.6	08.7	77	66.0	39.6	137	117.5	70.4	197	169.0	101.3	257	220.4	132.1
18	15.4	09.3	78	66.9	40.1	138	118.4	70.9	198	169.8	101.8	258	221.3	132.6
19	16.3	09.8	79	67.8	40.6	139	119.2	71.5	199	170.7	102.3	259	222.1	133.1
20	17.2	10.3	80	68.6	41.1	140	120.1	72.0	200	171.5	102.8	260	223.0	133.7
21	18.0	10.8	81	69.5	41.6	141	120.9	72.5	201	172.4	103.3	261	223.9	134.2
22	18.9	11.3	82	70.3	42.2	142	121.8	73.0	202	173.3	103.8	262	224.7	134.7
23	19 7	11.8	83	71.2	42.7	143	122.7	73.5	203	174.1	104.4	263	225.6	135.2
24	20.6	12.3	84	72.0	43.2	144	123.5	74.0	204	175.0	104.9	264	226.4	135.7
25	21.4	12.9	85	72.9	43.7	145	124.4	74.5	205	175.8	105.4	265	227.3	136.2
26	22.3	13.4	86	73.8	44.2	146	125.2	75.1	206	176.7	105.9	266	228.2	136 7
27	23.2	13.9	87	74.6	44.7	147	126.1	75.6	207	177.5	106.4	267	229.0	137.3
28	24.0	14.4	88	75.5	45.2	148	126.9	76.1	208	178.4	106.9	268	229.9	137.8
29	24.9	14.9	89	76.3	45.7	149	127.8	76.6	209	179.2	107.4	269	230.7	138.3
30	25.7	15.4	90	77.2	46.3	150	128.7	77.1	210	180.1	108.0	270	231.6	138.8
31	26.6	15.9	91	78.1	46.8	151	129.5	77.6	211	181.0	108.5	271	232.4	139.3
32	27.4	16.4	92	78.9	47.3	152	130.4	78.1	212	181.8	109.0	272	233.3	139.8
33	28.3	17.0	93	79.8	47.8	153	131.2	78.7	213	182.7	109.5	273	234.2	140.3
34	29.2	17.5	94	80.6	48.3	154	132.1	79.2	214	183.5	110.0	274	235.0	140.9
35	30.0	18.0	95	81.5	48.8	155	132.9	79.7	215	184.4	110.5	275	235.9	141.4
36	30.9	18.5	96	82.3	49.3	156	133.8	80.2	216	185.3	111.0	276	236.7	141.9
37	31.7	19.0	97	83.2	49.9	157	134.7	80.7	217	186.1	111.6	277	237.6	142.4
38	32.6	19.5	98	84.1	50.4	158	135.5	81.2	218	187.0	112.1	278	238.4	142.9
39	33.5	20.0	99	84.9	50.9	159	136.4	81.7	219	187.8	112.6	279	239.3	143.4
40	34.3	20.6	100	85.8	51.5	160	137.2	82.3	220	188.7	113.1	280	240.2	143.9
41	35.2	21.1	101	86.6	51.9	161	138.1	82.8	221	189.6	113.6	281	241.0	144.5
42	36.0	21.6	102	87.5	52.4	162	138.9	83.3	222	190.4	114.1	282	241.9	145.0
43	36.9	22.1	103	88.3	52.9	163	139.8	83.8	223	191.3	114.6	283	242.7	145.5
44	37.7	22.6	104	89.2	53.5	164	140.7	84.3	224	192.1	115.2	284	243.6	146.0
45	38.6	23.1	105	90.1	54.0	165	141.5	84.8	225	193.0	115.7	285	244.4	146.5
46	39.5	23.6	106	90.9	54.5	166	142.4	85.3	226	193.8	116.2	286	245.3	147.0
47	40.3	24.2	107	91.8	55.0	167	143.2	85.8	227	194.7	116.7	287	246.2	147 5
48	41.2	24.7	108	92.6	55.5	168	144.1	86.4	228	195.6	117.2	288	247.0	148.1
49	42.0	25.2	109	93.5	56.0	169	145.0	86.9	229	196.4	117.7	289	247.9	148.6
50	42.9	25.7	110	94.3	56.5	170	145.8	87.4	230	197.3	118.2	290	248.7	149.1
51	43.7	26.2	111	95.2	57.1	171	146.7	87.9	231	198.1	118.8	291	249.6	149.6
52	44.6	26.7	112	96.1	57.6	172	147.5	88.4	232	199.0	119.3	292	250.5	150.1
53	45.5	27.2	113	96.9	58.1	173	148.4	88.9	233	199.8	119.8	293	251.3	150.6
54	46.3	27.8	114	97.8	58.6	174	149.2	89.4	234	200.7	120.3	294	252.2	151.1
55	47.2	28.3	115	98.6	59.1	175	150.1	90.0	235	201.6	120.8	295	253.0	151.7
56	48.0	28.8	116	99.5	59.6	176	151.0	90.5	236	202.4	121.3	296	253.9	152.2
57	48.9	29.3	117	100.4	60.1	177	151.8	91.0	237	203.3	121.8	297	254.7	152.7
58	49.7	29.8	118	101 2	60.7	178	152.7	91.5	238	204.1	122.4	298	255.6	153.2
59	50.6	30.3	119	102.1	61.2	179	153.5	92.0	239	205.0	122.9	299	256.5	153.7
60	51.5	30.8	120	102.9	61.7	180	154.4	92.5	240	205.9	123.4	300	257.3	154.2
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 3 Points.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	50.7	33.9	121	100.6	67.2	181	150.5	100.6	241	200.4	133.9
2	01.7	01.1	62	51.5	34.4	122	101.4	67.8	182	151.3	101.1	242	201.2	134.4
3	02.5	01.7	63	52.4	35.0	123	102.3	68.3	183	152.2	101.7	243	202.0	135.0
4	03.3	02.2	64	53.2	35.6	124	103.1	68.9	184	153.0	102.2	244	202.9	135.6
5	04.2	02.8	65	54.0	36.1	125	103.9	69.4	185	153.8	102.8	245	203.7	136.1
6	05.0	03.3	66	54.9	36.7	126	104.8	70.0	186	154.6	103.3	246	204.5	136.7
7	05.8	03.9	67	55 7	37.2	127	105.6	70.6	187	155.5	103.9	247	205.4	137.2
8	06.7	04.4	68	56.5	37.8	128	106.4	71.1	188	156.3	104.4	248	206.2	137.8
9	07.5	05.0	69	57.4	38.3	129	107.3	71.7	189	157.1	105.0	249	207.0	138.3
10	08.3	05.6	70	58.2	38.9	130	108.1	72.2	190	158.0	105.6	250	207.9	138.9
11	09 1	06.1	71	59.0	39.4	131	108.9	72.8	191	158.8	106.1	251	208.7	139.4
12	10.0	06.7	72	59.9	40.0	132	109.7	73.3	192	159.6	106.7	252	209.5	140.0
13	10.8	07.2	73	60.7	40.6	133	110.6	73.9	193	160.5	107.2	253	210.4	140.6
14	11.6	07.8	74	61.5	41.1	134	111.4	74.4	194	161.3	107.8	254	211.2	141.1
15	12.5	08.3	75	62.4	41.7	135	112.2	75.0	195	162.1	108.3	255	212.0	141.7
16	13.3	08.9	76	63.2	42.2	136	113.1	75.6	196	163.0	108.9	256	212.9	142.2
17	14.1	09.4	77	64.0	42.8	137	113.9	76.1	197	163.8	109.4	257	213.7	142.8
18	15.0	10.0	78	64.8	43.3	138	114.7	76.7	198	164.6	110.0	258	214.5	143.3
19	15.8	10.6	79	65.7	43.9	139	115.6	77.2	199	165.5	110.6	259	215.3	143.9
20	16.6	11.1	80	66.5	44.4	140	116.4	77.8	200	166.3	111.1	260	216.2	144.4
21	17.5	11.7	81	67.3	45.0	141	117.2	78.3	201	167.1	111.7	261	217.0	145.0
22	18.3	12.2	82	68.2	45.6	142	118.1	78.9	202	168.0	112.2	262	217.8	145.6
23	19.1	12.8	83	69.0	46.1	143	118.9	79.4	203	168.8	112.8	263	218.7	146.1
24	20.0	13.3	84	69.8	46.7	144	119.7	80.0	204	169.6	113.3	264	219.5	146.7
25	20.8	13.9	85	70.7	47.2	145	120.6	80.6	205	170.4	113.9	265	220.3	147.2
26	21.6	14.4	86	71.5	47.8	146	121.4	81.1	206	171.3	114.4	266	221.2	147.8
27	22.4	15.0	87	72.3	48.3	147	122.2	81.7	207	172.1	115.0	267	222.0	148.3
28	23.3	15.6	88	73.2	48.9	148	123.1	82.2	208	172.9	115.6	268	222.8	148.9
29	24.1	16.1	89	74.0	49.4	149	123.9	82.8	209	173.8	116.1	269	223.7	149.4
30	24.9	16.7	90	74.8	50.0	150	124.7	83.3	210	174.6	116.7	270	224.5	150.0
31	25.8	17.2	91	75.7	50.6	151	125.5	83.9	211	175.4	117.2	271	225.3	150.6
32	26.6	17.8	92	76.5	51.1	152	126.4	84.4	212	176.3	117.8	272	226.2	151.1
33	27.4	18.3	93	77.3	51.7	153	127.2	85.0	213	177.1	118.3	273	227.0	151.7
34	28.3	18.9	94	78.2	52.2	154	128.0	85.6	214	177.9	118.9	274	227.8	152.2
35	29.1	19.4	95	79.0	52.8	155	128.9	86.1	215	178.8	119.4	275	228.6	152.8
36	29.9	20.0	96	79.8	53.3	156	129.7	86.7	216	179.6	120.0	276	229.5	153.3
37	30.8	20.6	97	80.6	53.9	157	130.5	87.2	217	180.4	120.6	277	230.3	153.9
38	31.6	21.1	98	81.5	54.4	158	131.4	87.8	218	181.3	121.1	278	231.1	154.4
39	32.4	21.7	99	82.3	55.0	159	132.2	88.3	219	182.1	121.7	279	232.0	155.0
40	33.3	22.2	100	83.1	55.6	160	133.0	88.9	220	182.9	122.2	280	232.8	155.6
41	34.1	22.8	101	84.0	56.1	161	133.9	89.4	221	183.7	122.8	281	233.6	156.1
42	34.9	23.3	102	84.8	56.7	162	134.7	90.0	222	184.6	123.3	282	234.5	156.7
43	35.8	23.9	103	85.6	57.2	163	135.5	90.6	223	185.4	123.9	283	235.3	157.2
44	36.6	24.4	104	86.5	57.8	164	136.4	91.1	224	186.2	124.4	284	236.1	157.8
45	37.4	25.0	105	87.3	58.3	165	137.2	91.7	225	187.1	125.0	285	237.0	158.3
46	38.2	25.6	106	88.1	58.9	166	138.0	92.2	226	187.9	125.6	286	237.8	158.9
47	39.1	26.1	107	89.0	59.4	167	138.9	92.8	227	188.7	126.1	287	238.6	159.4
48	39.9	26.7	108	89.8	60.0	168	139.7	93.3	228	189.6	126.7	288	239.5	160.0
49	40.7	27.2	109	90.6	60.6	169	140.5	93.9	229	190.4	127.2	289	240.3	160.6
50	41.6	27.8	110	91.5	61.1	170	141.3	94.4	230	191.2	127.8	290	241.1	161.1
51	42.4	28.3	111	92.3	61.7	171	142.2	95.0	231	192.1	128.3	291	242.0	161.7
52	43.2	28.9	112	93.1	62.2	172	143.0	95.6	232	192.9	128.9	292	242.8	162.2
53	44.1	29.4	113	94.0	62.8	173	143.8	96.1	233	193.7	129.4	293	243.6	162.8
54	44.9	30.0	114	94.8	63.3	174	144.7	96.7	234	194.6	130.0	294	244.4	163.3
55	45.7	30.6	115	95.6	63.9	175	145.5	97.2	235	195.4	130.6	295	245.3	163.9
56	46.6	31.1	116	96.4	64.4	176	146.3	97.8	236	196.2	131.1	296	246.1	164.4
57	47.4	31.7	117	97.3	65.0	177	147.2	98.3	237	197.1	131.7	295	246.9	165.0
58	48.2	32.2	118	98.1	65.6	178	148.0	98.9	238	197.9	132.2	298	247.8	165.6
59	49.1	32.8	119	98.9	66.1	179	148.8	99.4	239	198.7	132 8	299	248.6	166.1
60	49.9	33.3	120	99.8	66.7	180	149.7	100.0	240	199.5	133.3	300	249.4	166.7
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 5 Points.

Difference of Latitude and Departure for 3 ¼ Points.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	49.0	36.3	121	97.2	72.1	181	145.4	107.8	241	193.6	143.6
2	01.6	01.2	62	49.8	36.9	122	98.0	72.7	182	146.2	108.4	242	194.4	144.2
3	02.4	01.8	63	50.6	37.5	123	98.8	73.3	183	147.0	109.0	243	195.2	144.8
4	03.2	02.4	64	51.4	38.1	124	99.6	73.9	184	147.8	109.6	244	196.0	145.4
5	04.0	03.0	65	52.2	38.7	125	100 4	74.5	185	148.6	110.2	245	196.8	146.0
6	04.8	03.6	66	53.0	39.3	126	101.2	75.1	186	149.4	110.8	246	197.6	146.5
7	05.6	04.2	67	53.8	39.9	127	102.0	75.7	187	150.2	111.4	247	198.4	147.1
8	06.4	04.8	68	54.6	40.5	128	102.8	76.3	188	151.0	112.0	248	199.2	147.7
9	07.2	05.4	69	55.4	41.1	129	103.6	76.9	189	151.8	112.6	249	200.0	148.3
10	08.0	06.0	70	56.2	41.7	130	104.4	77.4	190	152.6	113.2	250	200.8	148.9
11	08.8	06.6	71	57.0	42.3	131	105.2	78.0	191	153.4	113.8	251	201.6	149.5
12	09.6	07.1	72	57.8	42.9	132	106.0	78.6	192	154.2	114.4	252	202.4	150.1
13	10.4	07.7	73	58.6	43.5	133	106.8	79.2	193	155.0	115.0	253	203.2	150.7
14	11.2	08.3	74	59.4	44.1	134	107.6	79.8	194	155.8	115.6	254	204.0	151.3
15	12.0	08.9	75	60.2	44.7	135	108.4	80.4	195	156.6	116.2	255	204.8	151.9
16	12.8	09.5	76	61.0	45.3	136	109.2	81.0	196	157.4	116.8	256	205.6	152.5
17	13.7	10.1	77	61.8	45.9	137	110.0	81.6	197	158.2	117.4	257	206.4	153.1
18	14.5	10.7	78	62.6	46.5	138	110.8	82.2	198	159.0	118.0	258	207.2	153.7
19	15.3	11.3	79	63.4	47.1	139	111.6	82.8	199	159.8	118.5	259	208.0	154.3
20	16.1	11.9	80	64.3	47.7	140	112.4	83.4	200	160.6	119.1	260	208.8	154.9
21	16.9	12.5	81	65.1	48.3	141	113.2	84.0	201	161.4	119.7	261	209.6	155.5
22	17.7	13.1	82	65.9	48.9	142	114.0	84.6	202	162.2	120.3	262	210.4	156.1
23	18.5	13.7	83	66.7	49.4	143	114.9	85.2	203	163.0	120.9	263	211.2	156.7
24	19.3	14.3	84	67.5	50.0	144	115.7	85.8	204	163.9	121.5	264	212.0	157.3
25	20.1	14.9	85	68.3	50.6	145	116.5	86.4	205	164.7	122.1	265	212.8	157.9
26	20.9	15.5	86	69.1	51.2	146	117.3	87.0	206	165.5	122.7	266	213.6	158.5
27	21.7	16.1	87	69.9	51.8	147	118.1	87.6	207	166.3	123.3	267	214.5	159.1
28	22.5	16.7	88	70.7	52.4	148	118.9	88.2	208	167.1	123.9	268	215.3	159.6
29	23.3	17.3	89	71.5	53.0	149	119.7	88.8	209	167.9	124.5	269	216.1	160.2
30	24.1	17.9	90	72.3	53.6	150	120.5	89.4	210	168.7	125.1	270	216.9	160.8
31	24.9	18.5	91	73.1	54.2	151	121.3	90.0	211	169.5	125.7	271	217.7	161.4
32	25.7	19.1	92	73.9	54.8	152	122.1	90.5	212	170.3	126.3	272	218.5	162.0
33	26.5	19.7	93	74.7	55.4	153	122.9	91.1	213	171.1	126.9	273	219.3	162.6
34	27.3	20.3	94	75.5	56.0	154	123.7	91.7	214	171.9	127.5	274	220.1	163.2
35	28.1	20.9	95	76.3	56.6	155	124.5	92.3	215	172.7	128.1	275	220.9	163.8
36	28.9	21.4	96	77.1	57.2	156	125.3	92.9	216	173.5	128.7	276	221.7	164.4
37	29.7	22.0	97	77.9	57.8	157	126.1	93.5	217	174.3	129.3	277	222.5	165.0
38	30.5	22.6	98	78.7	58.4	158	126.9	94.1	218	175.1	129.9	278	223.3	165.6
39	31.3	23.2	99	79.5	59.0	159	127.7	94.7	219	175.9	130.5	279	224.1	166.2
40	32.1	23.8	100	80.3	59.6	160	128.5	95.3	220	176.7	131.1	280	224.9	166.8
41	32.9	24.4	101	81.1	60.2	161	129.3	95.9	221	177.5	131.7	281	225.7	167.4
42	33.7	25.0	102	81.9	60.8	162	130.1	96.5	222	178.3	132.2	282	226.5	168.0
43	34.5	25.6	103	82.7	61.4	163	130.9	97.1	223	179.1	132.8	283	227.3	168.6
44	35.3	26.2	104	83.5	62.0	164	131.7	97.7	224	179.9	133.4	284	228.1	169.2
45	36.1	26.8	105	84.3	62.6	165	132.5	98.3	225	180.7	134.0	285	228.9	169.8
46	36.9	27.4	106	85.1	63.1	166	133.3	98.9	226	181.5	134.6	286	229.7	170.4
47	37.7	28.0	107	85.9	63.7	167	134.1	99.5	227	182.3	135.2	287	230.5	171.0
48	38.6	28.6	108	86.7	64.3	168	134.9	100.1	228	183.1	135.8	288	231.3	171.6
49	39.4	29.2	109	87.5	64.9	169	135.7	100.7	229	183.9	136.4	289	232.1	172.2
50	40.2	29.8	110	88.4	65.5	170	136.5	101.3	230	184.7	137.0	290	232.9	172.8
51	41.0	30.4	111	89.2	66.1	171	137.3	101.9	231	185.5	137.6	291	233.7	173.3
52	41.8	31.0	112	90.0	66.7	172	138.1	102.5	232	186.3	138.2	292	234.5	173.9
53	42.6	31.6	113	90.8	67.3	173	138.9	103.1	233	187.1	138.8	293	235.3	174.5
54	43.4	32.2	114	91.6	67.9	174	139.8	103.7	234	187.9	139.4	294	236.1	175.1
55	44.2	32.8	115	92.4	68.5	175	140.6	104.2	235	188.8	140.0	295	236.9	175.7
56	45.0	33.4	116	93.2	69.1	176	141.4	104.8	236	189.6	140.6	296	237.7	176.3
57	45.8	34.0	117	94.0	69.7	177	142.2	105.4	237	190.4	141.2	297	238.5	176.9
58	46.6	34.6	118	94.8	70.3	178	143.0	106.0	238	191.2	141.8	298	239.4	177.5
59	47 4	35.1	119	95.6	70.9	179	143.8	106.6	239	192.0	142.4	299	240.2	178.1
60	48.2	35.7	120	96.4	71.5	180	144.6	107.2	240	192.8	143.0	300	241.0	178 7
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE I.

Difference of Latitude and Departure for 3 ½ Points.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	47.1	38.7	121	93.5	76.8	181	139.9	114.8	241	186.3	152.9
2	01.5	01.3	62	47.9	39.3	122	94.3	77.4	182	140.7	115.5	242	187.1	153.5
3	02.3	01.9	63	48.7	40.0	123	95.1	78.0	183	141.5	116.1	243	187.8	154.2
4	03.1	02.5	64	49.5	40.6	124	95.8	78.7	184	142.2	116.7	244	188.6	154.8
5	03.9	03.2	65	50.2	41.2	125	96.6	79.3	185	143.0	117.4	245	189.4	155.4
6	04.6	03.8	66	51.0	41.9	126	97.4	79.9	186	143.8	118.0	246	190.2	156.1
7	05.4	04.4	67	51.8	42.5	127	98.2	80.6	187	144.5	118.6	247	190.9	156.7
8	06.2	05.1	68	52.6	43.1	128	98.9	81.2	188	145.3	119.3	248	191.7	157.3
9	07.0	05.7	69	53.3	43.8	129	99.7	81.8	189	146.1	119.9	249	192.5	158.0
10	07.7	06.3	70	54.1	44.4	130	100.5	82.5	190	146.9	120.5	250	193.2	158.6
11	08.5	07 0	71	54.9	45.0	131	101.3	83.1	191	147.6	121.2	251	194.0	159.2
12	09.3	07.6	72	55.7	45.7	132	102.0	83.7	192	148.4	121.8	252	194.8	159.9
13	10.1	08.2	73	56.4	46.3	133	102.8	84.4	193	149.2	122.4	253	195.6	160.5
14	10.8	08.9	74	57.2	46.9	134	103.6	85.0	194	150.0	123.1	254	196.3	161.1
15	11.6	09.5	75	58.0	47.6	135	104.4	85.6	195	150.7	123.7	255	197.1	161.8
16	12.4	10.1	76	58.7	48.2	136	105.1	86.3	196	151.5	124.3	256	197.9	162.4
17	13.1	10.8	77	59.5	48.8	137	105.9	86.9	197	152.3	125.0	257	198.7	163.0
18	13.9	11.4	78	60.3	49.5	138	106.7	87.5	198	153.1	125.6	258	199.4	163.7
19	14.7	12.0	79	61.1	50.1	139	107.4	88.2	199	153.8	126.2	259	200.2	164.3
20	15.5	12.7	80	61.8	50.7	140	108.2	88.8	200	154.6	126.9	260	201.0	164.9
21	16.2	13.3	81	62.6	51.4	141	109.0	89.4	201	155.4	127.5	261	201.8	165.6
22	17.0	14.0	82	63.4	52.0	142	109.8	90.1	202	156.1	128.1	262	202.5	166.2
23	17.8	14.6	83	64.2	52.7	143	110.5	90.7	203	156.9	128.8	263	203.3	166.8
24	18.5	15.2	84	64.9	53.3	144	111.3	91.3	204	157.7	129.4	264	204.1	167.5
25	19.3	15.9	85	65.7	53.9	145	112.1	92.0	205	158.5	130.0	265	204.8	168.1
26	20.1	16.5	86	66.5	54.6	146	112.9	92.6	206	159.2	130.7	266	205.6	168.7
27	20.9	17.1	87	67.2	55.2	147	113.6	93.3	207	160.0	131.3	267	206.4	169.4
28	21.6	17.8	88	68.0	55.8	148	114.4	93.9	208	160.8	132.0	268	207.2	170.0
29	22.4	18.4	89	68.8	56.5	149	115.2	94.5	209	161.6	132.6	269	207.9	170.6
30	23.2	19.0	90	69.6	57.1	150	115.9	95.2	210	162.3	133.2	270	208.7	171.3
31	24.0	19.7	91	70.3	57.7	151	116.7	95.8	211	163.1	133.9	271	209.5	171.9
32	24.7	20.3	92	71.1	58.4	152	117.5	96.4	212	163.9	134.5	272	210.3	172.6
33	25.5	20.9	93	71.9	59.0	153	118.3	97.1	213	164.6	135.1	273	211.0	173.2
34	26.3	21.6	94	72.7	59.6	154	119.0	97.7	214	165.4	135.8	274	211.8	173.8
35	27.1	22.2	95	73.4	60.3	155	119.8	98.3	215	166.2	136.4	275	212.6	174 5
36	27.8	22.8	96	74.2	60.9	156	120.6	99.0	216	167.0	137.0	276	213.3	175.1
37	28.6	23.5	97	75.0	61.5	157	121.4	99.6	217	167.7	137.7	277	214.1	175.7
38	29.4	24.1	98	75.7	62.2	158	122.1	100.2	218	168.5	138.3	278	214.9	176.4
39	30.1	24.7	99	76.5	62.8	159	122.9	100.9	219	169.3	138.9	279	215.7	177.0
40	30.9	25.4	100	77.3	63.4	160	123.7	101.5	220	170.1	139.6	280	216.4	177.6
41	31.7	26.0	101	78.1	64.1	161	124.4	102.1	221	170.8	140.2	281	217.2	178.3
42	32.5	26.6	102	78.8	64.7	162	125.2	102.8	222	171.6	140.8	282	218.0	178.9
43	33.2	27.3	103	79.6	65.3	163	126.0	103.4	223	172.4	141.5	283	218.8	179.5
44	34.0	27.9	104	80.4	66.0	164	126.8	104.0	224	173.1	142.1	284	219.5	180.2
45	34.8	28.5	105	81 2	66.6	165	127.5	104.7	225	173.9	142.7	285	220.3	180.8
46	35.6	29.2	106	81.9	67 2	166	128.3	105.3	226	174.7	143 4	286	221.1	181.4
47	36.3	29.8	107	82.7	67.9	167	129.1	105.9	227	175.5	144 0	287	221.8	182.1
48	37.1	30.4	108	83.5	68.5	168	129.9	106.6	228	176.2	144.6	288	222.6	182.7
49	37.9	31.1	109	84.3	69.1	169	130.6	107.2	229	177.0	145.3	289	223.4	183.3
50	38.6	31.7	110	85.0	69.8	170	131.4	107.8	230	177.8	145 9	290	224.2	184.0
51	39.4	32.3	111	85.8	70.4	171	132.2	108.5	231	178.6	146.5	291	224.9	184.6
52	40.2	33.0	112	86.6	71.0	172	133.0	109.1	232	179.3	147.2	292	225.7	185.2
53	41.0	33.6	113	87.3	71.7	173	133.7	109.7	233	180.1	147.8	293	226.5	185.9
54	41.7	34.3	114	88.1	72.3	174	134.5	110.4	234	180.9	148.4	294	227.3	186.5
55	42.5	34.9	115	88.9	73.0	175	135.3	111.0	235	181.7	149.1	295	228.0	187.1
56	43.3	35.5	116	89.7	73.6	176	136.0	111.6	236	182.4	149.7	296	228.8	187.8
57	44.1	36.2	117	90.4	74.2	177	136.8	112.3	237	183.2	150.3	297	229.6	188.4
58	44.8	36.8	118	91.2	74.9	178	137.6	112.9	238	184.0	151.0	298	230.4	189.0
59	45.6	37.4	119	92.0	75.5	179	138.4	113.6	239	184.7	151.6	299	231.1	189.7
60	46.4	38.1	120	92.8	76.1	180	139.1	114.2	240	185.5	152.3	300	231.9	190.3
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 4 ½ Points

Difference of Latitude and Departure for 3 ¾ Points.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	45.2	41.0	121	89.6	81.3	181	134.1	121.5	241	178.6	161.8
2	01.5	01.3	62	45.9	41.6	122	90.4	81.9	182	134.8	122.2	242	179.3	162.5
3	02.2	02.0	63	46.7	42.3	123	91.1	82.6	183	135.6	122.9	243	180.0	163.2
4	03.0	02.7	64	47.4	43.0	124	91.9	83.3	184	136.3	123.6	244	180.8	163.8
5	03.7	03.4	65	48.2	43.6	125	92.6	83.9	185	137.1	124.2	245	181.5	164.5
6	04.4	04.0	66	48.9	44.3	126	93.4	84.6	186	137.8	124.9	246	182.3	165.2
7	05.2	04.7	67	49.6	45.0	127	94.1	85.3	187	138.6	125.6	247	183.0	165.9
8	05.9	05.4	68	50.4	45.7	128	94.8	86.0	188	139.3	126.2	248	183.8	166.5
9	06.7	06.0	69	51.1	46.3	129	95.6	86.6	189	140.0	126.9	249	184.5	167.2
10	07.4	06.7	70	51.9	47.0	130	96.3	87.3	190	140.8	127.6	250	185.2	167.9
11	08.2	07.4	71	52.6	47.7	131	97.1	88.0	191	141.5	128.3	251	186.0	168.5
12	08.9	08.1	72	53.3	48.3	132	97.8	88.6	192	142.3	128.9	252	186.7	169.2
13	09.6	08.7	73	54.1	49.0	133	98.5	89.3	193	143.0	129.6	253	187.5	169.9
14	10.4	09.4	74	54.8	49.7	134	99.3	90.0	194	143.7	130.3	254	188.2	170.6
15	11.1	10.1	75	55.6	50.4	135	100.0	90.7	195	144.5	130.9	255	188.9	171.2
16	11.9	10.7	76	56.3	51.0	136	100.8	91.3	196	145.2	131.6	256	189.7	171.9
17	12.6	11.4	77	57.0	51.7	137	101.5	92.0	197	146.0	132.3	257	190.4	172.6
18	13.3	12.1	78	57.8	52.4	138	102.2	92.7	198	146.7	133.0	258	191.2	173.2
19	14.1	12.8	79	58.5	53.0	139	103.0	93.3	199	147.4	133.6	259	191.9	173.9
20	14.8	13.4	80	59.3	53.7	140	103.7	94.0	200	148.2	134.3	260	192.6	174.6
21	15.6	14.1	81	60.0	54.4	141	104.5	94.7	201	148.9	135.0	261	193.4	175.3
22	16.3	14.8	82	60.8	55.1	142	105.2	95.4	202	149.7	135.6	262	194.1	175.9
23	17.0	15.4	83	61.5	55.7	143	106.0	96.0	203	150.4	136.3	263	194.9	176.6
24	17.8	16.1	84	62.2	56.4	144	106.7	96.7	204	151.1	137.0	264	195.6	177.3
25	18.5	16.8	85	63.0	57.1	145	107.4	97.4	205	151.9	137.7	265	196.3	178.0
26	19.3	17.5	86	63.7	57.7	146	108.2	98.0	206	152.6	138.3	266	197.1	178.6
27	20.0	18.1	87	64.5	58.4	147	108.9	98.7	207	153.4	139.0	267	197.8	179.3
28	20.7	18.8	88	65.2	59.1	148	109.7	99.4	208	154.1	139.7	268	198.6	180.0
29	21.5	19.5	89	65.9	59.8	149	110.4	100.1	209	154.9	140.3	269	199.3	180.6
30	22.2	20.1	90	66.7	60.4	150	111.1	100.7	210	155.6	141.0	270	200.1	181.3
31	23.0	20.8	91	67.4	61.1	151	111.9	101.4	211	156.3	141.7	271	200.8	182.0
32	23.7	21.5	92	68.2	61.8	152	112.6	102.1	212	157.1	142.4	272	201.5	182.7
33	24.4	22.2	93	68.9	62.4	153	113.4	102.7	213	157.8	143.0	273	202.3	183.3
34	25.2	22.8	94	69.6	63.1	154	114.1	103.4	214	158.6	143.7	274	203.0	184.0
35	25.9	23.5	95	70.4	63.8	155	114.8	104.1	215	159.3	144.4	275	203.8	184.7
36	26.7	24.2	96	71.1	64.5	156	115.6	104.8	216	160.0	145.0	276	204.5	185.3
37	27.4	24.8	97	71.9	65.1	157	116.3	105.4	217	160.8	145.7	277	205.2	186.0
38	28.2	25.5	98	72.6	65.8	158	117.1	106.1	218	161.5	146.4	278	206.0	186.7
39	28.9	26.2	99	73.3	66.5	159	117.8	106.8	219	162.3	147.1	279	206.7	187.4
40	29.6	26.9	100	74.1	67.2	160	118.5	107.4	220	163.0	147.7	280	207.5	188.0
41	30.4	27.5	101	74.8	67.8	161	119.3	108.1	221	163.7	148.4	281	208.2	188.7
42	31.1	28.2	102	75.6	68.5	162	120.0	108.8	222	164.5	149.1	282	208.9	189.4
43	31.9	28.9	103	76.3	69.2	163	120.8	109.5	223	165.2	149.7	283	209.7	190.0
44	32.6	29.5	104	77.1	69.8	164	121.5	110.1	224	166.0	150.4	284	210.4	190.7
45	33.3	30.2	105	77.8	70.5	165	122.3	110.8	225	166.7	151.1	285	211.2	191.4
46	34.1	30.9	106	78.5	71.2	166	123.0	111.5	226	167.4	151.8	286	211.9	192.1
47	34.8	31.6	107	79.3	71.8	167	123.7	112.1	227	168.2	152.4	287	212.6	192.7
48	35.6	32.2	108	80.0	72.5	168	124.5	112.8	228	168.9	153.1	288	213.4	193.4
49	36.3	32.9	109	80.8	73.2	169	125.2	113.5	229	169.7	153.8	289	214.1	194.1
50	37.0	33.6	110	81.5	73.9	170	126.0	114.2	230	170.4	154.5	290	214.9	194.7
51	37.8	34.2	111	82.2	74.5	171	126.7	114.8	231	171.2	155.1	291	215.6	195.4
52	38.5	34.9	112	83.0	75.2	172	127.4	115.5	232	171.9	155.8	292	216.4	196.1
53	39.3	35.6	113	83.7	75.9	173	128.2	116.2	233	172.6	156.5	293	217.1	196 8
54	40.0	36.3	114	84.5	76.5	174	128.9	116.8	234	173.4	157.1	294	217.8	197.4
55	40.7	36.9	115	85.2	77.2	175	129.7	117.5	235	174.1	157.8	295	218.6	198.1
56	41.5	37.6	116	85.9	77.9	176	130.4	118.2	236	174.9	158.5	296	219.3	198.8
57	42.2	38.3	117	86.7	78.6	177	131.1	118.9	237	175.6	159.1	297	220.1	199.4
58	43.0	38.9	118	87.4	79.2	178	131.9	119.5	238	176.3	159.8	298	220.8	200.1
59	43.7	39.6	119	88.2	79.9	179	132.6	120.2	239	177.1	160.5	299	221.5	200.8
60	44.5	40.3	120	88.9	80.6	180	133.4	120.9	240	177.8	161.2	300	222.3	201.5
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 4 ½ Points.

Difference of Latitude and Departure for 4 Points.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	43.1	43.1	121	85.6	85.6	181	128.0	128.0	241	170.4	170.4
2	01.4	01.4	62	43.8	43.8	122	86.3	86.3	182	128.7	128.7	242	171.1	171.1
3	02.1	02.1	63	44.5	44.5	123	87.0	87.0	183	129.4	129.4	243	171.8	171.8
4	02.8	02.8	64	45.3	45.3	124	87.7	87.7	184	130.1	130.1	244	172.5	172.5
5	03.5	03.5	65	46.0	46.0	125	88.4	88.4	185	130.8	130.8	245	173.2	173.2
6	04.2	04.2	66	46.7	46.7	126	89.1	89.1	186	131.5	131.5	246	173.9	173.9
7	04.9	04.9	67	47.4	47.4	127	89.8	89.8	187	132.2	132.2	247	174.7	174.7
8	05.7	05.7	68	48.1	48.1	128	90.5	90.5	188	132.9	132.9	248	175.4	175.4
9	06.4	06.4	69	48.8	48.8	129	91.2	91.2	189	133.6	133.6	249	176.1	176.1
10	07.1	07.1	70	49.5	49.5	130	91.9	91.9	190	134.3	134.3	250	176.8	176 8
11	07.8	07.8	71	50.2	50.2	131	92.6	92.6	191	135.1	135.1	251	177.5	177.5
12	08.5	08.5	72	50.9	50.9	132	93.3	93.3	192	135.8	135.8	252	178.2	178.2
13	09.2	09.2	73	51.6	51.6	133	94.0	94.0	193	136.5	136.5	253	178.9	178.9
14	09.9	09.9	74	52.3	52.3	134	94.8	94.8	194	137.2	137.2	254	179.6	179.6
15	10.6	10.6	75	53.0	53.0	135	95.5	95.5	195	137.9	137.9	255	180.3	180.3
16	11.3	11.3	76	53.7	53.7	136	96.2	96.2	196	138.6	138.6	256	181.0	181.0
17	12.0	12.0	77	54.4	54.4	137	96.9	96.9	197	139.3	139.3	257	181.7	181.7
18	12.7	12.7	78	55.2	55.2	138	97.6	97.6	198	140.0	140.0	258	182.4	182.4
19	13.4	13.4	79	55.9	55.9	139	98.3	98.3	199	140.7	140.7	259	183.1	183.1
20	14.1	14.1	80	56.6	56.6	140	99.0	99.0	200	141.4	141.4	260	183.8	183.8
21	14.8	14.8	81	57.3	57.3	141	99.7	99.7	201	142.1	142.1	261	184.6	184.6
22	15.6	15.6	82	58.0	58.0	142	100.4	100.4	202	142.8	142.8	262	185.3	185.3
23	16.3	16.3	83	58.7	58.7	143	101.1	101.1	203	143.5	143.5	263	186.0	186.0
24	17.0	17.0	84	59.4	59.4	144	101.8	101.8	204	144.2	144.2	264	186.7	186.7
25	17.7	17.7	85	60.1	60.1	145	102.5	102.5	205	145.0	145.0	265	187.4	187.4
26	18.4	18.4	86	60.8	60.8	146	103.2	103.2	206	145.7	145.7	266	188.1	188.1
27	19.1	19.1	87	61.5	61 5	147	103.9	103.9	207	146.4	146.4	267	188.8	188.8
28	19.8	19.8	88	62.2	62.2	148	104.7	104.7	208	147.1	147.1	268	189.5	189.5
29	20.5	20.5	89	62.9	62.9	149	105.4	105.4	209	147.8	147.8	269	190.2	190.2
30	21.2	21.2	90	63.6	63.6	150	106.1	106.1	210	148.5	148.5	270	190.9	190.9
31	21.9	21.9	91	64.3	64.3	151	106.8	106.8	211	149.2	149.2	271	191.6	191.6
32	22.6	22.6	92	65.1	65.1	152	107.5	107.5	212	149.9	149.9	272	192.3	192.3
33	23.3	23.3	93	65.8	65.8	153	108.2	108.2	213	150.6	150.6	273	193.0	193.0
34	24.0	24.0	94	66.5	66.5	154	108.9	108.9	214	151.3	151.3	274	193.7	193.7
35	24.7	24.7	95	67.2	67.2	155	109.6	109.6	215	152.0	152.0	275	194.5	194.5
36	25.5	25.5	96	67.9	67.9	156	110.3	110.3	216	152.7	152.7	276	195.2	195.2
37	26.2	26.2	97	68.6	68.6	157	111.0	111.0	217	153.4	153.4	277	195.9	195.9
38	26.9	26.9	98	69.3	69.3	158	111.7	111.7	218	154.1	154.1	278	196.6	196.6
39	27.6	27.6	99	70.0	70.0	159	112.4	112.4	219	154.9	154.9	279	197.3	197.3
40	28.3	28.3	100	70.7	70.7	160	113.1	113.1	220	155.6	155.6	280	198.0	198.0
41	29.0	29.0	101	71.4	71.4	161	113.8	113.8	221	156.3	156.3	281	198.7	198.7
42	29.7	29.7	102	72.1	72.1	162	114.5	114.5	222	157.0	157.0	282	199.4	199.4
43	30.4	30.4	103	72.8	72.8	163	115.3	115.3	223	157.7	157.7	283	200.1	200.1
44	31.1	31.1	104	73.5	73.5	164	116.0	116.0	224	158.4	158.4	284	200.8	200.8
45	31.8	31.8	105	74.2	74.2	165	116.7	116.7	225	159.1	159.1	285	201.5	201.5
46	32.5	32.5	106	75.0	75.0	166	117.4	117.4	226	159.8	159.8	286	202.2	202.2
47	33.2	33.2	107	75.7	75.7	167	118.1	118.1	227	160.5	160.5	287	202.9	202.9
48	33.9	33.9	108	76.4	76.4	168	118.8	118.8	228	161.2	161.2	288	203.6	203.6
49	34.6	34.6	109	77.1	77.1	169	119.5	119.5	229	161.9	161.9	289	204.3	204.3
50	35.4	35.4	110	77.8	77.8	170	120.2	120.2	230	162.6	162.6	290	205.1	205.1
51	36.1	36.1	111	78.5	78.5	171	120.9	120.9	231	163.3	163.3	291	205.8	205.8
52	36.8	36.8	112	79.2	79.2	172	121.6	121.6	232	164.0	164.0	292	206.5	206.5
53	37.5	37.5	113	79.9	79.9	173	122.3	122.3	233	164.8	164.8	293	207.2	207.2
54	38.2	38.2	114	80.6	80.6	174	123.0	123.0	234	165.5	165.5	294	207.9	207.9
55	38.9	38.9	115	81.3	81.3	175	123.7	123.7	235	166.2	166.2	295	208.6	208.6
56	39.6	39.6	116	82.0	82.0	176	124.4	124.4	236	166.9	166.9	296	209.3	209.3
57	40.3	40.3	117	82.7	82.7	177	125.2	125.2	237	167.6	167.6	297	210.0	210.0
58	41.0	41.0	118	83.4	83.4	178	125.9	125.9	238	168.3	168.3	298	210.7	210.7
59	41.7	41.7	119	84.1	84.1	179	126.6	126.6	239	169.0	169.0	299	211.4	211.4
60	42.4	42.4	120	84.8	84.8	180	127.3	127.3	240	169.7	169.7	300	212.1	212.1
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 1 Degree.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.0	61	61.0	01.1	121	121.0	02.1	181	181.0	03.2	241	241.0	04.2
2	02.0	00.0	62	62.0	01.1	122	122.0	02.1	182	182.0	03.2	242	242.0	04.2
3	03.0	00.1	63	63.0	01.1	123	123.0	02.1	183	183.0	03.2	243	243.0	04.2
4	04.0	00.1	64	64.0	01.1	124	124.0	02.2	184	184.0	03.2	244	244.0	04.3
5	05.0	00.1	65	65.0	01.1	125	125.0	02.2	185	185.0	03.2	245	245.0	04.3
6	06.0	00.1	66	66.0	01.2	126	126.0	02.2	186	186.0	03.2	246	246.0	04.3
7	07.0	00.1	67	67.0	01.2	127	127.0	02.2	187	187.0	03.3	247	247.0	04.3
8	08.0	00.1	68	68.0	01.2	128	128.0	02.2	188	188.0	03.3	248	248.0	04.3
9	09.0	00.2	69	69.0	01.2	129	129.0	02.3	189	189.0	03.3	249	249.0	04.3
10	10.0	00.2	70	70.0	01.2	130	130.0	02.3	190	190.0	03.3	250	250.0	04.4
11	11.0	00.2	71	71.0	01.2	131	131.0	02.3	191	191.0	03.3	251	251.0	04.4
12	12.0	00.2	72	72.0	01.3	132	132.0	02.3	192	192.0	03.4	252	252.0	04.4
13	13.0	00.2	73	73.0	01.3	133	133.0	02.3	193	193.0	03.4	253	253.0	04.4
14	14.0	00.2	74	74.0	01.3	134	134.0	02.3	194	194.0	03.4	254	254.0	04.4
15	15.0	00.3	75	75.0	01.3	135	135.0	02.4	195	195.0	03.4	255	255.0	04.5
16	16.0	00.3	76	76.0	01.3	136	136.0	02.4	196	196.0	03.4	256	256.0	04.5
17	17.0	00.3	77	77.0	01.3	137	137.0	02.4	197	197.0	03.4	257	257.0	04.5
18	18.0	00.3	78	78.0	01.4	138	138.0	02.4	198	198.0	03.5	258	258.0	04.5
19	19.0	00.3	79	79.0	01.4	139	139.0	02.4	199	199.0	03.5	259	259.0	04.5
20	20.0	00.3	80	80.0	01.4	140	140.0	02.4	200	200.0	03.5	260	260.0	04.5
21	21.0	00.4	81	81.0	01.4	141	141.0	02.5	201	201.0	03.5	261	261.0	04.6
22	22.0	00.4	82	82.0	01.4	142	142.0	02.5	202	202.0	03.5	262	262.0	04.6
23	23.0	00.4	83	83.0	01.4	143	143.0	02.5	203	203.0	03.5	263	263.0	04.5
24	24.0	00.4	84	84.0	01.5	144	144.0	02.5	204	204.0	03.6	264	264.0	04.6
25	25.0	00.4	85	85.0	01.5	145	145.0	02.5	205	205.0	03.6	265	265.0	04.6
26	26.0	00.5	86	86.0	01.5	146	146.0	02.5	206	206.0	03.6	266	266.0	04.6
27	27.0	00.5	87	87.0	01.5	147	147.0	02.6	207	207.0	03.6	267	267.0	04.7
28	28.0	00.5	88	88.0	01.5	148	148.0	02.6	208	208.0	03.6	268	268.0	04.7
29	29.0	00.5	89	89.0	01.6	149	149.0	02.6	209	209.0	03.6	269	269.0	04.7
30	30.0	00.5	90	90.0	01.6	150	150.0	02.6	210	210.0	03.7	270	270.0	04.7
31	31.0	00.5	91	91.0	01.6	151	151.0	02.6	211	211.0	03.7	271	271.0	04.7
32	32.0	00.6	92	92.0	01.6	152	152.0	02.7	212	212.0	03.7	272	272.0	04.7
33	33.0	00.6	93	93.0	01.6	153	153.0	02.7	213	213.0	03.7	273	273.0	04.8
34	34.0	00.6	94	94.0	01.6	154	154.0	02.7	214	214.0	03.7	274	274.0	04.8
35	35.0	00.6	95	95.0	01.7	155	155.0	02.7	215	215.0	03.8	275	275.0	04.8
36	36.0	00.6	96	96.0	01.7	156	156.0	02.7	216	216.0	03.8	276	276.0	04.8
37	37.0	00.6	97	97.0	01.7	157	157.0	02.7	217	217.0	03.8	277	277.0	04.8
38	38.0	00.7	98	98.0	01.7	158	158.0	02.8	218	218.0	03.8	278	278.0	04.9
39	39.0	00.7	99	99.0	01.7	159	159.0	02.8	219	219.0	03.8	279	279.0	04.9
40	40.0	00.7	100	100.0	01.7	160	160.0	02.8	220	220.0	03.8	280	280.0	04.9
41	41.0	00.7	101	101.0	01.8	161	161.0	02.8	221	221.0	03.9	281	281.0	04.9
42	42.0	00.7	102	102.0	01.8	162	162.0	02.8	222	222.0	03.9	282	282.0	04.9
43	43.0	00.8	103	103.0	01.8	163	163.0	02.8	223	223.0	03.9	283	283.0	04.9
44	44.0	00.8	104	104.0	01.8	164	164.0	02.9	224	224.0	03.9	284	284.0	05.0
45	45.0	00.8	105	105.0	01.8	165	165.0	02.9	225	225.0	03.9	285	285.0	05.0
46	46.0	00.8	106	106.0	01.8	166	166.0	02.9	226	226.0	03.9	286	286.0	05.0
47	47.0	00.8	107	107.0	01.9	167	167.0	02.9	227	227.0	04.0	287	287.0	05.0
48	48.0	00.8	108	108.0	01.9	168	168.0	02.9	228	228.0	04.0	288	288.0	05.0
49	49.0	00.9	109	109.0	01.9	169	169.0	02.9	229	229.0	04.0	289	289.0	05.0
50	50.0	00.9	110	110.0	01.9	170	170.0	03.0	230	230.0	04.0	290	290.0	05.1
51	51.0	00.9	111	111.0	01.9	171	171.0	03.0	231	231.0	04.0	291	291.0	05.1
52	52.0	00.9	112	112.0	02.0	172	172.0	03.0	232	232.0	04.0	292	292.0	05.1
53	53.0	00.9	113	113.0	02.0	173	173.0	03.0	233	233.0	04.1	293	293.0	05.1
54	54.0	00.9	114	114.0	02.0	174	174.0	03.0	234	234.0	04.1	294	294.0	05.1
55	55.0	01.0	115	115.0	02.0	175	175.0	03.1	235	235.0	04.1	295	295.0	05.1
56	56.0	01.0	116	116.0	02.0	176	176.0	03.1	236	236.0	04.1	296	296.0	05.2
57	57.0	01.0	117	117.0	02.0	177	177.0	03.1	237	237.0	04.1	297	297.0	05.2
58	58.0	01.0	118	118.0	02.1	178	178.0	03.1	238	238.0	04.2	298	298.0	05.2
59	59.0	01.0	119	119.0	02.1	179	179.0	03.1	239	239.0	04.2	299	299.0	05.2
60	60.0	01.0	120	120.0	02.1	180	180.0	03.1	240	240.0	04.2	300	300.0	05.2
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 4 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.1	61	60.9	04.3	121	120.7	08.4	181	180.6	12.6	241	240.4	16 8
2	02.0	00.1	62	61.8	04.3	122	121.7	08.5	182	181.6	12.7	242	241.4	16 9
3	03.0	00 2	63	62.8	04.4	123	122.7	08.6	183	182.6	12.8	243	242.4	17.0
4	04.0	00 3	64	63.8	04.5	124	123.7	08.6	184	183.6	12.8	244	243.4	17.0
5	05.0	00.3	65	64.8	04.5	125	124.7	08.7	185	184.5	12.9	245	244.4	17.1
6	06.0	00.4	66	65.8	04.6	126	125.7	08.8	186	185.5	13.0	246	245.4	17.2
7	07.0	00.5	67	66.8	04.7	127	126.7	08.9	187	186.5	13.0	247	246.4	17 2
8	08.0	00.6	68	67.8	04.7	128	127.7	08.9	188	187.5	13.1	248	247.4	17.3
9	09.0	00.6	69	68.8	04.8	129	128.7	09.0	189	188.5	13.2	249	248.4	17.4
10	10.0	00.7	70	69.8	04.9	130	129.7	09.1	190	189.5	13.3	250	249.4	17.4
11	11.0	00.8	71	70.8	05.0	131	130.7	09.1	191	190.5	13.3	251	250.4	17.5
12	12.0	00.8	72	71.8	05.0	132	131.7	09.2	192	191.5	13.4	252	251.4	17.6
13	13.0	00.9	73	72.8	05.1	133	132.7	09.3	193	192.5	13.5	253	252.4	17.6
14	14.0	01.0	74	73.8	05.2	134	133.7	09.3	194	193.5	13.5	254	253.4	17.7
15	15.0	01.0	75	74.8	05.2	135	134.7	09.4	195	194.5	13.6	255	254.4	17.8
16	16.0	01.1	76	75.8	05.3	136	135.7	09.5	196	195.5	13.7	256	255.4	17.9
17	17.0	01.2	77	76.8	05.4	137	136.7	09.6	197	196.5	13.7	257	256.4	17.9
18	18.0	01.3	78	77.8	05.4	138	137.7	09.6	198	197.5	13.8	258	257.4	18.0
19	19.0	01.3	79	78.8	05.5	139	138.7	09.7	199	198.5	13.9	259	258.4	18.1
20	20.0	01.4	80	79.8	05.6	140	139.7	09.8	200	199.5	14.0	260	259.4	18.1
21	20.9	01.5	81	80.8	05.7	141	140.7	09.8	201	200.5	14.0	261	260.4	18.2
22	21.9	01.5	82	81.8	05.7	142	141.7	09.9	202	201.5	14.1	262	261.4	18.3
23	22.9	01.6	83	82.8	05.8	143	142.7	10.0	203	202.5	14.2	263	262.4	18.3
24	23.9	01.7	84	83.8	05.9	144	143.6	10.0	204	203.5	14.2	264	263.4	18.4
25	24.9	01.7	85	84.8	05.9	145	144.6	10.1	205	204.5	14.3	265	264.4	18.5
26	25.9	01.8	86	85.8	06.0	146	145.6	10.2	206	205.5	14.4	266	265.4	18.6
27	26.9	01.9	87	86.8	06.1	147	146.6	10.3	207	206.5	14.4	267	266.3	18.6
28	27.9	02.0	88	87.8	06.1	148	147.6	10.3	208	207.5	14.5	268	267.3	18.7
29	28.9	02.0	89	88.8	06.2	149	148.6	10.4	209	208.5	14.6	269	268.3	18.8
30	29.9	02.1	90	89.8	06.3	150	149.6	10.5	210	209.5	14.6	270	269.3	18.8
31	30.9	02.2	91	90.8	06.3	151	150.6	10.5	211	210.5	14.7	271	270.3	18.9
32	31.9	02.2	92	91.8	06.4	152	151.6	10.6	212	211.5	14.8	272	271.3	19.0
33	32.9	02.3	93	92.8	06.5	153	152.6	10.7	213	212.5	14.9	273	272.3	19.0
34	33.9	02.4	94	93.8	06.6	154	153.6	10.7	214	213.5	14.9	274	273.3	19.1
35	34.9	02.4	95	94.8	06.6	155	154.6	10.8	215	214.5	15.0	275	274.3	19.2
36	35.9	02.5	96	95.8	06.7	156	155.6	10.9	216	215.5	15.1	276	275.3	19.3
37	36.9	02.6	97	96.8	06.8	157	156.6	11.0	217	216.5	15.1	277	276.3	19.3
38	37.9	02.7	98	97.8	06.8	158	157.6	11.0	218	217.5	15.2	278	277.3	19.4
39	38.9	02.7	99	98.8	06.9	159	158.6	11.1	219	218.5	15.3	279	278.3	19.5
40	39.9	02.8	100	99.8	07.0	160	159.6	11.2	220	219.5	15.3	280	279.3	19.5
41	40.9	02.9	101	100.8	07.0	161	160.6	11.2	221	220.5	15.4	281	280.3	19.6
42	41.9	02.9	102	101.8	07.1	162	161.6	11.3	222	221.5	15.5	282	281.3	19.7
43	42.9	03.0	103	102.7	07.2	163	162.6	11.4	223	222.5	15.6	283	282.3	19.7
44	43.9	03.1	104	103.7	07.3	164	163.6	11.4	224	223.5	15.6	284	283.3	19.8
45	44.9	03.1	105	104.7	07.3	165	164.6	11.5	225	224.5	15.7	285	284.3	19.9
46	45.9	03.2	106	105.7	07.4	166	165.6	11.6	226	225.4	15.8	286	285.3	20.0
47	46.9	03.3	107	106.7	07.5	167	166.6	11.6	227	226.4	15.8	287	286.3	20.0
48	47.9	03.3	108	107.7	07.5	168	167.6	11.7	228	227.4	15.9	288	287.3	20.1
49	48.9	03.4	109	108.7	07.6	169	168.6	11.8	229	228.4	16.0	289	288.3	20.2
50	49.9	03.5	110	109.7	07.7	170	169.6	11.9	230	229.4	16.0	290	289.3	20.2
51	50.9	03.6	111	110.7	07.7	171	170.6	11.9	231	230.4	16.1	291	290.3	20.3
52	51.9	03.6	112	111.7	07.8	172	171.6	12.0	232	231.4	16.2	292	291.3	20.4
53	52.9	03.7	113	112.7	07.9	173	172.6	12.1	233	232.4	16.3	293	292.3	20.4
54	53.9	03.8	114	113.7	08.0	174	173.6	12.1	234	233.4	16.3	294	293.3	20.5
55	54.9	03.8	115	114.7	08.0	175	174.6	12.2	235	234.4	16.4	295	294.3	20.6
56	55.9	03.9	116	115.7	08.1	176	175.6	12.3	236	235.4	16.5	296	295.3	20.6
57	56.9	04.0	117	116.7	08.2	177	176.6	12.3	237	236.4	16.5	297	296.3	20.7
58	57.9	04.0	118	117.7	08.2	178	177.6	12.4	238	237.4	16.6	298	297.3	20.8
59	58.9	04.1	119	118	08.3	179	178.6	12.5	239	238.4	16.7	299	298.3	20.9
60	59.9	04.2	120	119.7	08.4	180	179.6	12.6	240	239.4	16.7	300	299.3	20.9
Dist	*Dep.*	*Lat.*	*Dist*	*Dep.*	*Lat.*	*Dist*	*Dep.*	*Lat.*	*Dist*	*Dep.*	*Lat.*	*Dist*	*Dep.*	*Lat.*

Difference of Latitude and Departure for 5 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.1	61	60.8	05.3	121	120.5	10.5	181	180.3	15.8	241	240.1	21.0
2	02.0	00.2	62	61.8	05.4	122	121.5	10.6	182	181.3	15.9	242	241.1	21.1
3	03.0	00.3	63	62.8	05.5	123	122.5	10.7	183	182.3	15.9	243	242.1	21.2
4	04.0	00.3	64	63.8	05.6	124	123.5	10.8	184	183.3	16.0	244	243.1	21.3
5	05.0	00.4	65	64.8	05.7	125	124.5	10.9	185	184.3	16.1	245	244.1	21.4
6	06.0	00.5	66	65.7	05.8	126	125.5	11.0	186	185.3	16.2	246	245.1	21.4
7	07.0	00.6	67	66.7	05.8	127	126.5	11.1	187	186.3	16.3	247	246.1	21.5
8	08.0	00.7	68	67.7	05.9	128	127.5	11.2	188	187.3	16.4	248	247.1	21.6
9	09.0	00.8	69	68.7	06.0	129	128.5	11.2	189	188.3	16.5	249	248.1	21.7
10	10.0	00.9	70	69.7	06.1	130	129.5	11.3	190	189.3	16.6	250	249.0	21.8
11	11.0	01.0	71	70.7	06.2	131	130.5	11.4	191	190.3	16.6	251	250.0	21.9
12	12.0	01.0	72	71.7	06.3	132	131.5	11.5	192	191.3	16.7	252	251.0	22.0
13	13.0	01.1	73	72.7	06.4	133	132.5	11.6	193	192.3	16.8	253	252.0	22.1
14	13.9	01.2	74	73.7	06.4	134	133.5	11.7	194	193.3	16.9	254	253.0	22.1
15	14.9	01.3	75	74.7	06.5	135	134.5	11.8	195	194.3	17.0	255	254.0	22.2
16	15.9	01.4	76	75.7	06.6	136	135.5	11.9	196	195.3	17.1	256	255.0	22.3
17	16.9	01.5	77	76.7	06.7	137	136.5	11.9	197	196.3	17.2	257	256.0	22.4
18	17.9	01.6	78	77.7	06.8	138	137.5	12.0	198	197.2	17.3	258	257.0	22.5
19	18.9	01.7	79	78.7	06.9	139	138.5	12.1	199	198.2	17.3	259	258.0	22.6
20	19.9	01.7	80	79.7	07.0	140	139.5	12.2	200	199.2	17.4	260	259.0	22.7
21	20.9	01.8	81	80.7	07.1	141	140.5	12.3	201	200.2	17.5	261	260.0	22.7
22	21.9	01.9	82	81.7	07.1	142	141.5	12.4	202	201.2	17.6	262	261.0	22.8
23	22.9	02.0	83	82.7	07.2	143	142.5	12.5	203	202.2	17.7	263	262.0	22.9
24	23.9	02.1	84	83.7	07.3	144	143.5	12.6	204	203.2	17.8	264	263.0	23.0
25	24.9	02.2	85	84.7	07.4	145	144.4	12.6	205	204.2	17.9	265	264.0	23.1
26	25.9	02.3	86	85.7	07.5	146	145.4	12.7	206	205.2	18.0	266	265.0	23.2
27	26.9	02.4	87	86.7	07.6	147	146.4	12.8	207	206.2	18.0	267	266.0	23.3
28	27.9	02.4	88	87.7	07.7	148	147.4	12.9	208	207.2	18.1	268	267.0	23.4
29	28.9	02.5	89	88.7	07.8	149	148.4	13.0	209	208.2	18.2	269	268.0	23.4
30	29.9	02.6	90	89.7	07.8	150	149.4	13.1	210	209.2	18.3	270	269.0	23.5
31	30.9	02.7	91	90.7	07.9	151	150.4	13.2	211	210.2	18.4	271	270.0	23.6
32	31.9	02.8	92	91.6	08.0	152	151.4	13.2	212	211.2	18.5	272	271.0	23.7
33	32.9	02.9	93	92.6	08.1	153	152.4	13.3	213	212.2	18.6	273	272.0	23.8
34	33.9	03.0	94	93.6	08.2	154	153.4	13.4	214	213.2	18.7	274	273.0	23.9
35	34.9	03.1	95	94.6	08.3	155	154.4	13.5	215	214.2	18.7	275	274.0	24.0
36	35.9	03.1	96	95.6	08.4	156	155.4	13.6	216	215.2	18.8	276	274.9	24.1
37	36.9	03.2	97	96.6	08.5	157	156.4	13.7	217	216.2	18.9	277	275.9	24.1
38	37 9	03.3	98	97.6	08.5	158	157.4	13.8	218	217.2	19.0	278	276.9	24.2
39	38.9	03.4	99	98.6	08.6	159	158.4	13.9	219	218.2	19.1	279	277.9	24.3
40	39.8	03.5	100	99.6	08.7	160	159.4	13.9	220	219.2	19.2	280	278.9	24.4
41	40.8	03.6	101	100.6	08.8	161	160.4	14.0	221	220.2	19.3	281	279.9	24.5
42	41.8	03.7	102	101.6	08.9	162	161.4	14.1	222	221.2	19.3	282	280.9	24.6
43	42.8	03.7	103	102.6	09.0	163	162.4	14.2	223	222.2	19.4	283	281.9	24.7
44	43.8	03.8	104	103.6	09.1	164	163.4	14.3	224	223.1	19.5	284	282.9	24.8
45	44.8	03.9	105	104.6	09.2	165	164.4	14.4	225	224.1	19.6	285	283.9	24.8
46	45.8	04.0	106	105.6	09.2	166	165.4	14.5	226	225.1	19.7	286	284.9	24.9
47	46.8	04.1	107	106.6	09.3	167	166.4	14.6	227	226.1	19.8	287	285.9	25.0
48	47.8	04.2	108	107.6	09.4	168	167.4	14.6	228	227.1	19.9	288	286.9	25.1
49	48.8	04.3	109	108.6	09.5	169	168.4	14.7	229	228.1	20.0	289	287.9	25.2
50	49.8	04.4	110	109.6	09.6	170	169.4	14.8	230	229.1	20.0	290	288.9	25.3
51	50.8	04.4	111	110.6	09.7	171	170.3	14.9	231	230.1	20.1	291	289.9	25.4
52	51.8	04.5	112	111.6	09.8	172	171.3	15.0	232	231.1	20.2	292	290.9	25.4
53	52.8	04.6	113	112.6	09.8	173	172.3	15.1	233	232.1	20.3	293	291.9	25.5
54	53.8	04.7	114	113.6	09.9	174	173.3	15.2	234	233.1	20.4	294	292.9	25.6
55	54.8	04.8	115	114.6	10.0	175	174.3	15.3	235	234.1	20.5	295	293.9	25.7
56	55.8	04.9	116	115.6	10.1	176	175.3	15.3	236	235.1	20.6	296	294.9	25.8
57	56.8	05.0	117	116.6	10.2	177	176.3	15.4	237	236.1	20.7	297	295.9	25.9
58	57.8	05.1	118	117.6	10.3	178	177.3	15.5	238	237.1	20.7	298	296.9	26.0
59	58.8	05.1	119	118.5	10.4	179	178.3	15.6	239	238.1	20.8	299	297.9	26.1
60	59.8	05.2	120	119.5	10.5	180	179.3	15.7	240	239.1	20.9	300	298.9	26.1
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 6 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.1	61	60.7	06.4	121	120.3	12.6	181	180.0	18.9	241	239.7	25.2
2	02.0	00.2	62	61.7	06.5	122	121.3	12.8	182	181.0	19.0	242	240.7	25.3
3	03.0	00.3	63	62.7	06.6	123	122.3	12.9	183	182.0	19.1	243	241.7	25.4
4	04.0	00.4	64	63.6	06.7	124	123.3	13.0	184	183.0	19.2	244	242.7	25.5
5	05.0	00.5	65	64.6	06.8	125	124.3	13.1	185	184.0	19.3	245	243.7	25.6
6	06.0	00.6	66	65.6	06 9	126	125.3	13.2	186	185.0	19.4	246	244.7	25.7
7	07.0	00.7	67	66.6	07.0	127	126.3	13.3	187	186.0	19.5	247	245.6	25.8
8	08.0	00.8	68	67.6	07.1	128	127.3	13.4	188	187.0	19.7	248	246.6	25.9
9	09.0	00.9	69	68.6	07.2	129	128.3	13.5	189	188.0	19.8	249	247.6	26.0
10	09.9	01.0	70	69.6	07.3	130	129.3	13.6	190	189.0	19.9	250	248.6	26.1
11	10.9	01.1	71	70.6	07.4	131	130.3	13.7	191	190.0	20.0	251	249.6	26.2
12	11.9	01.3	72	71.6	07.5	132	131.3	13.8	192	190.9	20.1	252	250.6	26.3
13	12.9	01.4	73	72.6	07.6	133	132.3	13.9	193	191.9	20.2	253	251.6	26.4
14	13.9	01.5	74	73.6	07.7	134	133.3	14.0	194	192.9	20.3	254	252.6	26.6
15	14.9	01.6	75	74.6	07.8	135	134.3	14.1	195	193.9	20.4	255	253.6	26.7
16	15.9	01.7	76	75.6	07.9	136	135.3	14.2	196	194.9	20.5	256	254.6	26.8
17	16.9	01.8	77	76.6	08.0	137	136.2	14.3	197	195.9	20.6	257	255.6	26.9
18	17.9	01.9	78	77.6	08.2	138	137.2	14.4	198	196.9	20.7	258	256.6	27.0
19	18.9	02.0	79	78.6	08.3	139	138.2	14.5	199	197.9	20.8	259	257.6	27.1
20	19.9	02.1	80	79.6	08 4	140	139.2	14.6	200	198.9	20.9	260	258.6	27.2
21	20.9	02.2	81	80.6	08.5	141	140.2	14.7	201	199.9	21.0	261	259.6	27.3
22	21.9	02.3	82	81.6	08.6	142	141.2	14.8	202	200.9	21.1	262	260.6	27.4
23	22.9	02.4	83	82.5	08.7	143	142.2	14.9	203	201.9	21.2	263	261.6	27.5
24	23.9	02.5	84	83.5	08.8	144	143.2	15.1	204	202.9	21.3	264	262.6	27.6
25	24.9	02.6	85	84.5	08 9	145	144.2	15.2	205	203.9	21.4	265	263.5	27.7
26	25.9	02.7	86	85.5	09.0	146	145.2	15.3	206	204.9	21.5	266	264.5	27.8
27	26.9	02.8	87	86.5	09.1	147	146.2	15.4	207	205.9	21.6	267	265.5	27.9
28	27.8	02.9	88	87.5	09.2	148	147.2	15.5	208	206.9	21.7	268	266.5	28.0
29	28.8	03.0	89	88.5	09.3	149	148.2	15.6	209	207.9	21.8	269	267.5	28.1
30	29.8	03.1	90	89.5	09.4	150	149.2	15.7	210	208.8	22.0	270	268.5	28.2
31	30.8	03.2	91	90.5	09.5	151	150.2	15.8	211	209.8	22.1	271	269.5	28.3
32	31.8	03.3	92	91.5	09.6	152	151.2	15.9	212	210.8	22.2	272	270.5	28.4
33	32.8	03.4	93	92.5	09.7	153	152.2	16.0	213	211.8	22.3	273	271.5	28.5
34	33.8	03.6	94	93.5	09.8	154	153.2	16.1	214	212.8	22.4	274	272.5	28.6
35	34.8	03.7	95	94.5	09.9	155	154.2	16.2	215	213.8	22.5	275	273.5	28.7
36	35.8	03.8	96	95.5	10.0	156	155.1	16.3	216	214.8	22.6	276	274.5	28.8
37	36.8	03.9	97	96.5	10.1	157	156.1	16.4	217	215.8	22.7	277	275.5	29.0
38	37.8	04.0	98	97.5	10.2	158	157.1	16.5	218	216.8	22.8	278	276.5	29.1
39	38.8	04.1	99	98.5	10.3	159	158.1	16.6	219	217.8	22.9	279	277.5	29.2
40	39.8	04.2	100	99.5	10.5	160	159.1	16.7	220	218.8	23.0	280	278.5	29.3
41	40.8	04.3	101	100.4	10.6	161	160.1	16.8	221	219.8	23.1	281	279.5	29.4
42	41.8	04.4	102	101.4	10.7	162	161.1	16.9	222	220.8	23.2	282	280.5	29.5
43	42.8	04.5	103	102.4	10.8	163	162.1	17.0	223	221.8	23.3	283	281.4	29.6
44	43.8	04.6	104	103.4	10.9	164	163.1	17.1	224	222.8	23.4	284	282.4	29.7
45	44.8	04.7	105	104.4	11.0	165	164.1	17.2	225	223.8	23.5	285	283.4	29.8
46	45.7	04.8	106	105.4	11.1	166	165.1	17.4	226	224.8	23.6	286	284.4	29.9
47	46.7	04.9	107	106.4	11.2	167	166.1	17.5	227	225.8	23.7	287	285.4	30.0
48	47.7	05.0	108	107.4	11.3	168	167.1	17.6	228	226.8	23.8	288	286.4	30.1
49	48.7	05 1	109	108.4	11.4	169	168.1	17.7	229	227.7	23.9	289	287.4	30.2
50	49.7	05.2	110	109.4	11.5	170	169.1	17.8	230	228.7	24.0	290	288.4	30.3
51	50.7	05.3	111	110.4	11.6	171	170.1	17.9	231	229.7	24.1	291	289.4	30.4
52	51.7	05.4	112	111.4	11.7	172	171.1	18.0	232	230.7	24.3	292	290.4	30.5
53	52.7	05.5	113	112.4	11.8	173	172.1	18.1	233	231.7	24.4	293	291.4	30.6
54	53.7	05.6	114	113.4	11.9	174	173.0	18.2	234	232.7	24.5	294	292.4	30.7
55	54.7	05.7	115	114.4	12.0	175	174.0	18.3	235	233.7	24.6	295	293.4	30.8
56	55.7	05.9	116	115.4	12.1	176	175.0	18.4	236	234.7	24.7	296	294.4	30.9
57	56.7	06.0	117	116.4	12.2	177	176.0	18.5	237	235.7	24.8	297	295.4	31.0
58	57.7	06.1	118	117.4	12.3	178	177.0	18.6	238	236.7	24.9	298	296.4	31.1
59	58.7	06.2	119	118.3	12.4	179	178.0	18.7	239	237.7	25.0	299	297.4	31.3
60	59.7	06.3	120	119.3	12.5	180	179.0	18.8	240	238.7	25.1	300	298.4	31.4
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 7 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.1	61	60.5	07.4	121	120.1	14.7	181	179.7	22.1	241	239.2	29.4
2	02.0	00.2	62	61.5	07.6	122	121.1	14.9	182	180.6	22.2	242	240.2	29.5
3	03.0	00.4	63	62.5	07.7	123	122.1	15.0	183	181.6	22.3	243	241.2	29.6
4	04.0	00.5	64	63.5	07.8	124	123.1	15.1	184	182.6	22.4	244	242.2	29.7
5	05.0	00.6	65	64.5	07.9	125	124.1	15.2	185	183.6	22.5	245	243.2	29.9
6	06.0	00.7	66	65.5	08.0	126	125.1	15.4	186	184.6	22.7	246	244.2	30.0
7	06.9	00.9	67	66.5	08.2	127	126.1	15.5	187	185.6	22.8	247	245.2	30.1
8	07.9	01.0	68	67.5	08.3	128	127.0	15.6	188	186.6	22.9	248	246.2	30.2
9	08.9	01.1	69	68.5	08.4	129	128.0	15.7	189	187.6	23.0	249	247.1	30.3
10	09.9	01.2	70	69.5	08.5	130	129.0	15.8	190	188.6	23.2	250	248.1	30.5
11	10.9	01.3	71	70.5	08.7	131	130.0	16.0	191	189.6	23.3	251	249.1	30.6
12	11.9	01.5	72	71.5	08.8	132	131.0	16.1	192	190.6	23.4	252	250.1	30.7
13	12.9	01.6	73	72.5	08.9	133	132.0	16.2	193	191.6	23.5	253	251.1	30.8
14	13.9	01.7	74	73.4	09.0	134	133.0	16.3	194	192.6	23.6	254	252.1	31.0
15	14.9	01.8	75	74.4	09.1	135	134.0	16.5	195	193.5	23.8	255	253.1	31.1
16	15.9	01.9	76	75.4	09.3	136	135.0	16.6	196	194.5	23.9	256	254.1	31.2
17	16.9	02.1	77	76.4	09.4	137	136.0	16.7	197	195.5	24.0	257	255.1	31.3
18	17.9	02.2	78	77.4	09.5	138	137.0	16.8	198	196.5	24.1	258	256.1	31.4
19	18.9	02.3	79	78.4	09.6	139	138.0	16.9	199	197.5	24.3	259	257.1	31.6
20	19.9	02.4	80	79.4	09.7	140	139.0	17.1	200	198.5	24.4	260	258.1	31.7
21	20.8	02.6	81	80.4	09.9	141	139.9	17.2	201	199.5	24.5	261	259.1	31.8
22	21.8	02.7	82	81.4	10.0	142	140.9	17.3	202	200.5	24.6	262	260.0	31.9
23	22.8	02.8	83	82.4	10.1	143	141.9	17.4	203	201.5	24.7	263	261.0	32.1
24	23.8	02.9	84	83.4	10.2	144	142.9	17.5	204	202.5	24.9	264	262.0	32.2
25	24.8	03.0	85	84.4	10.4	145	143.9	17.7	205	203.5	25.0	265	263.0	32.3
26	25.8	03.2	86	85.4	10.5	146	144.9	17.8	206	204.5	25.1	266	264.0	32.4
27	26.8	03.3	87	86.4	10.6	147	145.9	17.9	207	205.5	25.2	267	265.0	32.5
28	27.8	03.4	88	87.3	10.7	148	146.9	18.0	208	206.4	25.3	268	266.0	32.7
29	28.8	03.5	89	88.3	10.8	149	147.9	18.2	209	207.4	25.5	269	267.0	32.8
30	29.8	03.7	90	89.3	11.0	150	148.9	18.3	210	208.4	25.6	270	268.0	32.9
31	30.8	03.8	91	90.3	11.1	151	149.9	18.4	211	209.4	25.7	271	269.0	33.0
32	31.8	03.9	92	91.3	11.2	152	150.9	18.5	212	210.4	25.8	272	270.0	33.1
33	32.8	04.0	93	92.3	11.3	153	151.9	18.6	213	211.4	26.0	273	271.0	33.3
34	33.7	04.1	94	93.3	11.5	154	152.9	18.8	214	212.4	26.1	274	272.0	33.4
35	34.7	04.3	95	94.3	11.6	155	153.8	18.9	215	213.4	26.2	275	273.0	33.5
36	35.7	04.4	96	95.3	11.7	156	154.8	19.0	216	214.4	26.3	276	273.9	33.6
37	36.7	04.5	97	96.3	11.8	157	155.8	19.1	217	215.4	26.4	277	274.9	33.8
38	37.7	04.6	98	97.3	11.9	158	156.8	19.3	218	216.4	26.6	278	275.9	33.9
39	38.7	04.8	99	98.3	12.1	159	157.8	19.4	219	217.4	26.7	279	276.9	34.0
40	39.7	04.9	100	99.3	12.2	160	158.8	19.5	220	218.4	26.8	280	277.9	34.1
41	40.7	05.0	101	100.2	12.3	161	159.8	19.6	221	219.4	26.9	281	278.9	34.2
42	41.7	05.1	102	101.2	12.4	162	160.8	19.7	222	220.3	27.1	282	279.9	34.4
43	42.7	05.2	103	102.2	12.6	163	161.8	19.9	223	221.3	27.2	283	280.9	34.5
44	43.7	05.4	104	103.2	12.7	164	162.8	20.0	224	222.3	27.3	284	281.9	34.6
45	44.7	05.5	105	104.2	12.8	165	163.8	20.1	225	223.3	27.4	285	282.9	34.7
46	45.7	05.6	106	105.2	12.9	166	164.8	20.2	226	224.3	27.5	286	283.9	34.9
47	46.6	05.7	107	106.2	13.0	167	165.8	20.4	227	225.3	27.7	287	284.9	35.0
48	47.6	05.8	108	107.2	13.2	168	166.7	20.5	228	226.3	27.8	288	285.9	35.1
49	48.6	06.0	109	108.2	13.3	169	167.7	20.6	229	227.3	27.9	289	286.8	35.2
50	49.6	06.1	110	109.2	13.4	170	168.7	20.7	230	228.3	28.0	290	287.8	35.3
51	50.6	06.2	111	110.2	13.5	171	169.7	20.8	231	229.3	28.2	291	288.8	35.5
52	51.6	06.3	112	111.2	13.6	172	170.7	21.0	232	230.3	28.3	292	289.8	35.6
53	52.6	06.5	113	112.2	13.8	173	171.7	21.1	233	231.3	28.4	293	290.8	35 7
54	53.6	06.6	114	113.2	13.9	174	172.7	21.2	234	232.3	28.5	294	291.8	35.8
55	54.6	06.7	115	114.1	14.0	175	173.7	21.3	235	233.2	28.6	295	292.8	36.0
56	55.6	06.8	116	115.1	14.1	176	174.7	21.4	236	234.2	28.8	296	293.8	36.1
57	56.6	06.9	117	116.1	14.3	177	175.7	21.6	237	235.2	28.9	297	294.8	36.2
58	57.6	07.1	118	117.1	14.4	178	176.7	21.7	238	236.2	29.0	298	295.8	36.3
59	58.6	07.2	119	118.1	14.5	179	177.7	21.8	239	237.2	29.1	299	296.8	36.4
60	59.6	07.3	120	119.1	14.6	180	178.7	21.9	240	238.2	29.2	300	297.8	36.6
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 8 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.1	61	60.4	08.5	121	119.8	16.8	181	179.2	25.2	241	238.7	33.5
2	02.0	00.3	62	61.4	08.6	122	120.8	17.0	182	180.2	25.3	242	239.6	33.7
3	03.0	00.4	63	62.4	08.8	123	121.8	17.1	183	181.2	25.5	243	240.6	33.8
4	04.0	00.6	64	63.4	08.9	124	122.8	17.3	184	182.2	25.6	244	241.6	34 0
5	05.0	00.7	65	64.4	09.0	125	123.8	17.4	185	183.2	25.7	245	242.6	34.1
6	05.9	00.8	66	65.4	09.2	126	124.8	17.5	186	184.2	25.9	246	243.6	34.2
7	06.9	01.0	67	66.3	09.3	127	125.8	17.7	187	185.2	26.0	247	244.6	34.4
8	07.9	01.1	68	67.3	09.5	128	126.8	17.8	188	186.2	26.2	248	245.6	34.5
9	08.9	01.3	69	68.3	09.6	129	127.7	18.0	189	187.2	26.3	249	246.6	34.7
10	09.9	01.4	70	69.3	09.7	130	128.7	18.1	190	188.2	26.4	250	247.6	34.8
11	10.9	01.5	71	70.3	09.9	131	129.7	18.2	191	189.1	26.6	251	248.6	34.9
12	11.9	01.7	72	71.3	10.0	132	130.7	18.4	192	190.1	26.7	252	249.5	35.1
13	12.9	01.8	73	72.3	10.2	133	131.7	18.5	193	191.1	26.9	253	250.5	35.2
14	13.9	01.9	74	73.3	10.3	134	132.7	18.6	194	192.1	27.0	254	251.5	35.3
15	14.9	02.1	75	74.3	10.4	135	133.7	18.8	195	193.1	27.1	255	252.5	35.5
16	15.8	02.2	76	75.3	10.6	136	134.7	18.9	196	194.1	27.3	256	253.5	35.6
17	16.8	02.4	77	76.3	10.7	137	135.7	19.1	197	195.1	27.4	257	254.5	35.8
18	17.8	02.5	78	77.2	10.9	138	136.7	19.2	198	196.1	27.6	258	255.5	35.9
19	18.8	02.6	79	78.2	11.0	139	137.7	19.3	199	197.1	27.7	259	256.5	36.0
20	19.8	02.8	80	79.2	11.1	140	138.6	19.5	200	198.1	27.8	260	257.5	36.2
21	20.8	02.9	81	80.2	11.3	141	139.6	19.6	201	199.0	28 0	261	258 5	36.3
22	21.8	03.1	82	81.2	11.4	142	140.6	19.8	202	200.0	28.1	262	259.5	36.5
23	22.8	03.2	83	82.2	11.6	143	141.6	19.9	203	201.0	28.3	263	260.4	36.6
24	23.8	03.3	84	83.2	11.7	144	142.6	20.0	204	202.0	28.4	264	261.4	36.7
25	24.8	03.5	85	84.2	11.8	145	143.6	20.2	205	203.0	28.5	265	262.4	36.9
26	25.7	03.6	86	85.2	12.0	146	144.6	20.3	206	204.0	28.7	266	263.4	37.0
27	26.7	03.8	87	86.2	12.1	147	145.6	20.5	207	205.0	28.8	267	264.4	37.2
28	27.7	03.9	88	87.1	12.2	148	146.6	20.6	208	206.0	28.9	268	265.4	37.3
29	28.7	04.0	89	88.1	12.4	149	147.5	20.7	209	207.0	29.1	269	266.4	37.4
30	29.7	04.2	90	89.1	12.5	150	148.5	20.9	210	208.0	29.2	270	267.4	37.6
31	30.7	04.3	91	90.1	12.7	151	149.5	21.0	211	208.9	29.4	271	268.4	37.7
32	31.7	04.5	92	91.1	12.8	152	150.5	21.2	212	209.9	29.5	272	269.4	37.9
33	32.7	04.6	93	92.1	12.9	153	151.5	21.3	213	210.9	29.6	273	270.3	38.0
34	33.7	04.7	94	93.1	13.1	154	152.5	21.4	214	211.9	29.8	274	271.3	38.1
35	34.7	04.9	95	94.1	13.2	155	153.5	21.6	215	212.9	29.9	275	272.3	38.3
36	35.6	05.0	96	95.1	13.4	156	154.5	21.7	216	213.9	30.1	276	273.3	38.4
37	36.6	05.1	97	96.1	13.5	157	155.5	21.9	217	214.9	30.2	277	274.3	38.6
38	37.6	05.3	98	97.0	13.6	158	156.5	22.0	218	215.9	30.3	278	275.3	38.7
39	38.6	05.4	99	98.0	13.8	159	157.5	22.1	219	216.9	30.5	279	276.3	38.8
40	39.6	05.6	100	99.0	13.9	160	158.4	22.3	220	217.9	30.6	280	277.3	39.0
41	40.6	05.7	101	100.0	14.1	161	159.4	22.4	221	218.8	30.8	281	278.3	39.1
42	41.6	05.8	102	101.0	14.2	162	160.4	22.5	222	219.8	30.9	282	279.3	39.2
43	42.6	06.0	103	102.0	14.3	163	161.4	22.7	223	220.8	31.0	283	280.2	39.4
44	43.6	06.1	104	103.0	14.5	164	162.4	22.8	224	221.8	31.2	284	281.2	39.5
45	44.6	06.3	105	104.0	14.6	165	163.4	23.0	225	222.8	31.3	285	282.2	39.7
46	45.6	06.4	106	105.0	14.8	166	164.4	23.1	226	223.8	31.5	286	283.2	39.8
47	46.5	06.5	107	106.0	14.9	167	165.4	23.2	227	224.8	31.6	287	284.2	39.9
48	47.5	00.7	108	106.9	15.0	168	166.4	23.4	228	225.8	31.7	288	285.2	40.1
49	48.5	06.8	109	107.9	15.2	169	167.4	23.5	229	226.8	31.9	289	286.2	40.2
50	49.5	07.0	110	108.9	15.3	170	168.3	23.7	230	227.8	32.0	290	287.2	40.4
51	50.5	07.1	111	109.9	15.4	171	169.3	23.8	231	228.8	32.1	291	288.2	40.5
52	51.5	07.2	112	110.9	15.6	172	170.3	23.9	232	229.7	32.3	292	289.2	40.6
53	52.5	07.4	113	111.9	15.7	173	171.3	24.1	233	230.7	32.4	293	290.1	40.8
54	53.5	07.5	114	112.9	15.9	174	172.3	24.2	234	231.7	32.6	294	291.1	40.9
55	54.5	07.7	115	113.9	16.0	175	173.3	24.4	235	232.7	32.7	295	292.1	41.1
56	55.5	07.8	116	114.9	16.1	176	174.3	24.5	236	233.7	32.8	296	293.1	41.2
57	56.4	07.9	117	115.9	16.3	177	175.3	24.6	237	234.7	33.0	297	294.1	41.3
58	57.4	08.1	118	116.9	16.4	178	176.3	24.8	238	235.7	33.1	298	295.1	41.5
59	58.4	08.2	119	117.8	16.6	179	177.3	24.9	239	236.7	33.3	299	296.1	41.6
60	59.4	08.4	120	118.8	16.7	180	178.2	25.1	240	237.7	33.4	300	297.1	41.8
Dist	Dep.	Lat	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 9 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.2	61	60.2	09.5	121	119.5	18.9	181	178.8	28.3	241	238.0	37.7
2	02.0	00.3	62	61.2	09.7	122	120.5	19.1	182	179.8	28.5	242	239.0	37.9
3	03.0	00.5	63	62.2	09.9	123	121.5	19.2	183	180.7	28.6	243	240.0	38.0
4	04.0	00.6	64	63.2	10.0	124	122.5	19.4	184	181.7	28.8	244	241.0	38.2
5	04.9	00.8	65	64.2	10.2	125	123.5	19.6	185	182.7	28.9	245	242.0	38.3
6	05.9	00.9	66	65.2	10.3	126	124.4	19.7	186	183.7	29.1	246	243.0	38.5
7	06.9	01.1	67	66.2	10.5	127	125.4	19.9	187	184.7	29.3	247	244.0	38.6
8	07.9	01.3	68	67.2	10.6	128	126.4	20.0	188	185.7	29.4	248	244.9	38.8
9	08.9	01.4	69	68.2	10.8	129	127.4	20.2	189	186.7	29.6	249	245.9	39.0
10	09.9	01.6	70	69.1	11.0	130	128.4	20.3	190	187.7	29.7	250	246.9	39.1
11	10.9	01.7	71	70.1	11.1	131	129.4	20.5	191	188.6	29.9	251	247.9	39.3
12	11.9	01.9	72	71.1	11.3	132	130.4	20.6	192	189.6	30.0	252	248.9	39.4
13	12.8	02.0	73	72.1	11.4	133	131.4	20.8	193	190.6	30.2	253	249.9	39.6
14	13.8	02.2	74	73.1	11.6	134	132.4	21.0	194	191.6	30.3	254	250.9	39.7
15	14.8	02.3	75	74.1	11.7	135	133.3	21.1	195	192.6	30.5	255	251.9	39.9
16	15.8	02.5	76	75.1	11.9	136	134.3	21.3	196	193.6	30.7	256	252.8	40.0
17	16.8	02.7	77	76.1	12.0	137	135.3	21.4	197	194.6	30.8	257	253.8	40.2
18	17.8	02.8	78	77.0	12.2	138	136.3	21.6	198	195.6	31.0	258	254.8	40.4
19	18.8	03.0	79	78.0	12.4	139	137.3	21.7	199	196.5	31.1	259	255.8	40.5
20	19.8	03.1	80	79.0	12.5	140	138.3	21.9	200	197.5	31.3	260	256.8	40.7
21	20.7	03.3	81	80.0	12.7	141	139.3	22.1	201	198.5	31.4	261	257.8	40.8
22	21.7	03.4	82	81.0	12.8	142	140.3	22.2	202	199.5	31.6	262	258.8	41.0
23	22.7	03.6	83	82.0	13.0	143	141.2	22.4	203	200.5	31.8	263	259.8	41.1
24	23.7	03.8	84	83.0	13.1	144	142.2	22.5	204	201.5	31.9	264	260.7	41.3
25	24.7	03.9	85	84.0	13.3	145	143.2	22.7	205	202.5	32.1	265	261.7	41.5
26	25.7	04.1	86	84.9	13.5	146	144.2	22.8	206	203.5	32.2	266	262.7	41.6
27	26.7	04.2	87	85.9	13.6	147	145.2	23.0	207	204.5	32.4	267	263.7	41.8
28	27.7	04.4	88	86.9	13.8	148	146.2	23.2	208	205.4	32.5	268	264.7	41.9
29	28.6	04.5	89	87.9	13.9	149	147.2	23.3	209	206.4	32.7	269	265.7	42.1
30	29.6	04.7	90	88.9	14.1	150	148.2	23.5	210	207.4	32.9	270	266.7	42.2
31	30.6	04.8	91	89.9	14.2	151	149.1	23.6	211	208.4	33.0	271	267.7	42.4
32	31.6	05.0	92	90.9	14.4	152	150.1	23.8	212	209.4	33.2	272	268.7	42.6
33	32.6	05.2	93	91.9	14.5	153	151.1	23.9	213	210.4	33.3	273	269.6	42.7
34	33.6	05.3	94	92.8	14.7	154	152.1	24.1	214	211.4	33.5	274	270.6	42.9
35	34.6	05.5	95	93.8	14.9	155	153.1	24.2	215	212.4	33.6	275	271.6	43.0
36	35.6	05.6	96	94.8	15.0	156	154.1	24.4	216	213.3	33.8	276	272.6	43.2
37	36.5	05.8	97	95.8	15.2	157	155.1	24.6	217	214.3	33.9	277	273.6	43.3
38	37.5	05.9	98	96.8	15.3	158	156.1	24.7	218	215.3	34.1	278	274.6	43.5
39	38.5	06.1	99	97.8	15.5	159	157.0	24.9	219	216.3	34.3	279	275.6	43.6
40	39.5	06.3	100	98.8	15.6	160	158.0	25.0	220	217.3	34.4	280	276.6	43.8
41	40.5	06.4	101	99.8	15.8	161	159.0	25.2	221	218.3	34.6	281	277.5	44.0
42	41.5	06.6	102	100.7	16.0	162	160.0	25.3	222	219.3	34.7	282	278.5	44.1
43	42.5	06.7	103	101.7	16.1	163	161.0	25.5	223	220.3	34.9	283	279.5	44.3
44	43.5	06.9	104	102.7	16.3	164	162.0	25.7	224	221.2	35.0	284	280.5	44.4
45	44.4	07.0	105	103.7	16.4	165	163.0	25.8	225	222.2	35.2	285	281.5	44.6
46	45.4	07.2	106	104.7	16.6	166	164.0	26.0	226	223.2	35.4	286	282.5	44.7
47	46.4	07.4	107	105.7	16.7	167	164.9	26.1	227	224.2	35.5	287	283.5	44.9
48	47.4	07.5	108	106.7	16.9	168	165.9	26.3	228	225.2	35.7	288	284.5	45.1
49	48.4	07.7	109	107.7	17.1	169	166.9	26.4	229	226.2	35.8	289	285.4	45.2
50	49.4	07.8	110	108.6	17.2	170	167.9	26.6	230	227.2	36.0	290	286.4	45.4
51	50.4	08.0	111	109.6	17.4	171	168.9	26.8	231	228.2	36.1	291	287.4	45.5
52	51.4	08.1	112	110.6	17.5	172	169.9	26.9	232	229.1	36.3	292	288.4	45.7
53	52.3	08.3	113	111.6	17.7	173	170.9	27.1	233	230.1	36.4	293	289.4	45.8
54	53.3	08.4	114	112.6	17.8	174	171.9	27.2	234	231.1	36.6	294	290.4	46.0
55	54.3	08.6	115	113.6	18.0	175	172.8	27.4	235	232.1	36.8	295	291.4	46.1
56	55.3	08.8	116	114.6	18.1	176	173.8	27.5	236	233.1	36.9	296	292.4	46.3
57	56.3	08.9	117	115.6	18.3	177	174.8	27.7	237	234.1	37.1	297	293.3	46.5
58	57.3	09.1	118	116.5	18.5	178	175.8	27.8	238	235.1	37.2	298	294.3	46.6
59	58.3	09.2	119	117.5	18.6	179	176.8	28.0	239	236.1	37.4	299	295.3	46.8
60	59.3	09.4	120	118.5	18.8	180	177.8	28.2	240	237.0	37.5	300	296.3	46.9
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 10 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.2	61	60.1	10.6	121	119.2	21.0	181	178.3	31.4	241	237.3	41.8
2	02.0	00.3	62	61.1	10.8	122	120.1	21.2	182	179.2	31.6	242	238.3	42.0
3	03.0	00.5	63	62.0	10.9	123	121.1	21.4	183	180.2	31.8	243	239.3	42.2
4	03.9	00.7	64	63.0	11.1	124	122.1	21.5	184	181.2	32.0	244	240.3	42.4
5	04.9	00.9	65	64.0	11.3	125	123.1	21.7	185	182.2	32.1	245	241.3	42.5
6	05.9	01.0	66	65.0	11.5	126	124.1	21.9	186	183.2	32.3	246	242.3	42.7
7	06.9	01.2	67	66.0	11.6	127	125.1	22.1	187	184.2	32.5	247	243.2	42.9
8	07.9	01.4	68	67.0	11.8	128	126.1	22.2	188	185.1	32.6	248	244.2	43.1
9	08.9	01.6	69	68.0	12.0	129	127.0	22.4	189	186.1	32.8	249	245.2	43.2
10	09.8	01.7	70	68.9	12.2	130	128.0	22.6	190	187.1	33.0	250	246.2	43.4
11	10.8	01.9	71	69.9	12.3	131	129.0	22.7	191	188.1	33.2	251	247.2	43.6
12	11.8	02.1	72	70.9	12.5	132	130.0	22.9	192	189.1	33.3	252	248.2	43.8
13	12.8	02.3	73	71.9	12.7	133	131.0	23.1	193	190.1	33.5	253	249.2	43.9
14	13.8	02.4	74	72.9	12.8	134	132.0	23.3	194	191.1	33.7	254	250.1	44.1
15	14.8	02.6	75	73.9	13.0	135	132.9	23.4	195	192.0	33.9	255	251.1	44.3
16	15.8	02.8	76	74.8	13.2	136	133.9	23.6	196	193.0	34 0	256	252.1	44.5
17	16.7	03.0	77	75.8	13.4	137	134.9	23.8	197	194.0	34.2	257	253.1	44.6
18	17.7	03.1	78	76.8	13.5	138	135.9	24.0	198	195.0	34.4	258	254.1	44.8
19	18.7	03.3	79	77.8	13.7	139	136.9	24.1	199	196.0	34.6	259	255.1	45.0
20	19.7	03.5	80	78.8	13.9	140	137.9	24.3	200	197.0	34.7	260	256.1	45.1
21	20.7	03.6	81	79.8	14.1	141	138.9	24.5	201	197.9	34.9	261	257.0	45.3
22	21.7	03.8	82	80.8	14.2	142	139.8	24.7	202	198.9	35.1	262	258.0	45.5
23	22.7	04.0	83	81.7	14.4	143	140.8	24.8	203	199.9	35.3	263	259.0	45.7
24	23.6	04.2	84	82.7	14.6	144	141.8	25.0	204	200.9	35.4	264	260.0	45.8
25	24.6	04.3	85	83.7	14.8	145	142.8	25.2	205	201.9	35.6	265	261.0	46.0
26	25.6	04.5	86	84.7	14.9	146	143.8	25.4	206	202.9	35.8	266	262.0	46.2
27	26.6	04.7	87	85.7	15.1	147	144.8	25.5	207	203.9	35.9	267	262.9	46.4
28	27.6	04.9	88	86.7	15.3	148	145.8	25.7	208	204.8	36.1	268	263.9	46.5
29	28.6	05.0	89	87.6	15.5	149	146.7	25.9	209	205.8	36.3	269	264.9	46.7
30	29.5	05.2	90	88.6	15.6	150	147.7	26.0	210	206.8	36.5	270	265.9	46.9
31	30.5	05.4	91	89.6	15.8	151	148.7	26.2	211	207.8	36.6	271	266.9	47.1
32	31.5	05.6	92	90.6	16.0	152	149.7	26.4	212	208.8	36.8	272	267.9	47.2
33	32.5	05.7	93	91.6	16.1	153	150.7	26.6	213	209.8	37.0	273	268.9	47.4
34	33.5	05.9	94	92.6	16.3	154	151.7	26.7	214	210.7	37.2	274	269.8	47.6
35	34.5	06.1	95	93.6	16.5	155	152.6	26.9	215	211.7	37.3	275	270.8	47.8
36	35.5	06.3	96	94.5	16.7	156	153.6	27.1	216	212.7	37.5	276	271.8	47.9
37	36.4	06.4	97	95.5	16.8	157	154.6	27.3	217	213.7	37.7	277	272.8	48.1
38	37.4	06.6	98	96.5	17.0	158	155.6	27.4	218	214.7	37.9	278	273.8	48.3
39	38.4	06.8	99	97.5	17.2	159	156.6	27.6	219	215.7	38.0	279	274.8	48.4
40	39.4	06.9	100	98.5	17.4	160	157.6	27.8	220	216.7	38.2	280	275.7	48.6
41	40.4	07.1	101	99.5	17.5	161	158.6	28.0	221	217.6	38.4	281	276.7	48.8
42	41.4	07.3	102	100.5	17.7	162	159.5	28.1	222	218.6	38.5	282	277.7	49.0
43	42.3	07.5	103	101.4	17.9	163	160.5	28.3	223	219.6	38.7	283	278.7	49.1
44	43.3	07.6	104	102.4	18.1	164	161.5	28.5	224	220.6	38.9	284	279.7	49.3
45	44.3	07.8	105	103.4	18.2	165	162.5	28.7	225	221.6	39.1	285	280.7	49.5
46	45.3	08.0	106	104.4	18.4	166	163.5	28.8	226	222.6	39.2	286	281.7	49.7
47	46.3	08.2	107	105.4	18.6	167	164.5	29.0	227	223.6	39.4	287	282.6	49.8
48	47.3	08.3	108	106.4	18.8	168	165.4	29.2	228	224.5	39.6	288	283.6	50.0
49	48.3	08.5	109	107.3	18.9	169	166.4	29.3	229	225.5	39.8	289	284.6	50.2
50	49.2	08.7	110	108.3	19.1	170	167.4	29.5	230	226.5	39.9	290	285.6	50.4
51	50.2	08.9	111	109.3	19.3	171	168.4	29.7	231	227.5	40.1	291	286.6	50.5
52	51.2	09.0	112	110.3	19.4	172	169.4	29.9	232	228.5	40.3	292	287.6	50.7
53	52.2	09.2	113	111.3	19.6	173	170.4	30.0	233	229.5	40.5	293	288.5	50.9
54	53.2	09.4	114	112.3	19.8	174	171.4	30.2	234	230.4	40.6	294	289.5	51.1
55	54.2	09.6	115	113.3	20.0	175	172.3	30.4	235	231.4	40.8	295	290.5	51.2
56	55.1	09.7	116	114.2	20.1	176	173.3	30.6	236	232.4	41.0	296	291.5	51.4
57	56.1	09.9	117	115.2	20.3	177	174.3	30.7	237	233.4	41.2	297	292.5	51.6
58	57.1	10.1	118	116.2	20.5	178	175.3	30.9	238	234.4	41.3	298	293.5	51.7
59	58.1	10.2	119	117.2	20.7	179	176.3	31.1	239	235.4	41.5	299	294.5	51.9
60	59.1	10.4	120	118.2	20.8	180	177.3	31.3	240	236.4	41.7	300	295.4	52.1
Dist	*Dep.*	*Lat.*	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 11 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.2	61	59.9	11.6	121	118.8	23.1	181	177.7	34.5	241	236.6	46.0
2	02.0	00.4	62	60.9	11.8	122	119.8	23.3	182	178.7	34.7	242	237.6	46.2
3	02.9	00.6	63	61.8	12.0	123	120.7	23.5	183	179.6	34.9	243	238.5	46.4
4	03.9	00.8	64	62.8	12.2	124	121.7	23.7	184	180.6	35.1	244	239.5	46.6
5	04.9	01.0	65	63.8	12.4	125	122.7	23.9	185	181.6	35.3	245	240.5	46.7
6	05.9	01.1	66	64.8	12.6	126	123.7	24.0	186	182.6	35.5	246	241.5	46.9
7	06.9	01.3	67	65.8	12.8	127	124.7	24.2	187	183.6	35.7	247	242.5	47.1
8	07.9	01.5	68	66.8	13.0	128	125.6	24.4	188	184.5	35.9	248	243.4	47.3
9	08.8	01.7	69	67.7	13.2	129	126.6	24.6	189	185.5	36.1	249	244.4	47.5
10	09.8	01.9	70	68.7	13.4	130	127.6	24.8	190	186.5	36.3	250	245.4	47.7
11	10.8	02.1	71	69.7	13.5	131	128.6	25.0	191	187.5	36.4	251	246.4	47.9
12	11.8	02.3	72	70.7	13.7	132	129.6	25.2	192	188 5	36.6	252	247.4	48.1
13	12.8	02.5	73	71.7	13.9	133	130.6	25.4	193	189.5	36.8	253	248.4	48.3
14	13.7	02.7	74	72.6	14.1	134	131.5	25.6	194	190.4	37.0	254	249.3	48.5
15	14.7	02.9	75	73.6	14.3	135	132.5	25.8	195	191.4	37.2	255	250.3	48.7
16	15.7	03.1	76	74.6	14.5	136	133.5	26.0	196	192.4	37.4	256	251.3	48.8
17	16.7	03.2	77	75.6	14.7	137	134.5	26.1	197	193.4	37.6	257	252.3	49.0
18	17.7	03.4	78	76.6	14 9	138	135.5	26.3	198	194.4	37.8	258	253.3	49.2
19	18.7	03.6	79	77.5	15.1	139	136.4	26.5	199	195.3	38.0	259	254.2	49.4
20	19.6	03.8	80	78.5	15.3	140	137.4	26.7	200	196.3	38.2	260	255.2	49.6
21	20.6	04.0	81	79.5	15.5	141	138.4	26.9	201	197.3	38.4	261	256.2	49.8
22	21.6	04.2	82	80.5	15.6	142	139.4	27.1	202	198.3	38.5	262	257.2	50.0
23	22.6	04.4	83	81.5	15.8	143	140.4	27.3	203	199.3	38.7	263	258.2	50.2
24	23.6	04.6	84	82.5	16.0	144	141.4	27.5	204	200.3	38.9	264	259.1	50.4
25	24.5	04.8	85	83.4	16.2	145	142.3	27.7	205	201.2	39.1	265	260.1	50.6
26	25.5	05.0	86	84.4	16.4	146	143.3	27.9	206	202.2	39.3	266	261.1	50.8
27	26.5	05.2	87	85.4	16.6	147	144.3	28.0	207	203.2	39.5	267	262.1	50.9
28	27.5	05.3	88	86.4	16.8	148	145.3	28.2	208	204.2	39.7	268	263.1	51.1
29	28.5	05.5	89	87.4	17.0	149	146.3	28.4	209	205.2	39.9	269	264.1	51.3
30	29 4	05.7	90	88.3	17.2	150	147.2	28.6	210	206.1	40.1	270	265.0	51.5
31	30.4	05.9	91	89.3	17.4	151	148.2	28.8	211	207.1	40.3	271	266.0	51.7
32	31.4	06.1	92	90.3	17.6	152	149.2	29.0	212	208.1	40.5	272	267.0	51.9
33	32.4	06.3	93	91.3	17.7	153	150.2	29.2	213	209.1	40.6	273	268.0	52.1
34	33.4	06.5	94	92.3	17.9	154	151.2	29.4	214	210.1	40.8	274	269.0	52.3
35	34.4	06.7	95	93.3	18.1	155	152.2	29.6	215	211.0	41.0	275	269.9	52.5
30	35.3	06.9	96	94.2	18.3	156	153.1	29.8	216	212.0	41.2	276	270.9	52.7
37	36.3	07.1	97	95.2	18.5	157	154.1	30.0	217	213.0	41.4	277	271.9	52.9
38	37.3	07.3	98	96.2	18.7	158	155.1	30.1	218	214.0	41.6	278	272.9	53.0
39	38.3	07.4	99	97.2	18.9	159	156.1	30.3	219	215.0	41.8	279	273.9	53.2
40	39.3	07.6	100	98.2	19.1	160	157.1	30.5	220	216.0	42.0	280	274.9	53.4
41	40.2	07.8	101	99.1	19.3	161	158.0	30.7	221	216.9	42.2	281	275.8	53.6
42	41.2	08.0	102	100.1	19.5	162	159.0	30.9	222	217.9	42.4	282	276.8	53.8
43	42.2	08.2	103	101.1	19.7	163	160.0	31.1	223	218.9	42.6	283	277.8	54.0
44	43.2	08.4	104	102.1	19.8	164	161.0	31.3	224	219.9	42.7	284	278.8	54.2
45	44.2	08.6	105	103.1	20.0	165	162.0	31.5	225	220.9	42.9	285	279.8	54.4
46	45.2	08.8	106	104.1	20.2	166	163.0	31.7	226	221.8	43.1	286	280.7	54.6
47	46.1	09.0	107	105.0	20.4	167	163.9	31.9	227	222.8	43.3	287	281.7	54.8
48	47.1	09.2	108	106.0	20.6	168	164.9	32.1	228	223.8	43.5	288	282.7	55.0
49	48.1	09.3	109	107.0	20.8	169	165.9	32.2	229	224.8	43.7	289	283.7	55.1
50	49.1	09.5	110	108.0	21.0	170	166.9	32.4	230	225.8	43.9	290	284.7	55.3
51	50.1	09.7	111	109.0	21.2	171	167.9	32.6	231	226.8	44.1	291	285 7	55.5
52	51.0	09.9	112	109.9	21.4	172	168.8	32.8	232	227.7	44.3	292	286.6	55.7
53	52.0	10.1	113	110.9	21.6	173	169.8	33.0	233	228.7	44.5	293	287.6	55.9
54	53.0	10.3	114	111.9	21.8	174	170.8	33.2	234	229.7	44.6	294	288.6	56.1
55	54.0	10.5	115	112.9	21.9	175	171.8	33.4	235	230.7	44.8	295	289.6	56.3
56	55.0	10.7	116	113.9	22.1	176	172.8	33.6	236	231.7	45.0	296	90.6	56.5
57	56.0	10.9	117	114.9	22.3	177	173.7	33.8	237	232.6	45.2	297	291.5	56.7
58	56.9	11.1	118	115.8	22.5	178	174.7	34.0	238	233.6	45.4	298	292.5	56.9
59	57.9	11.3	119	116.8	22.7	179	175.7	34.2	239	234.6	45.6	299	293.5	57.1
60	58.9	11.4	120	117.8	22.9	180	176.7	34.3	240	235.6	45.8	300	294.5	57.2
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 12 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.2	61	59.7	12.7	121	118.4	25.2	181	177.0	37.6	241	235.7	50.1
2	02.0	00.4	62	60.6	12.9	122	119.3	25.4	182	178.0	37.8	242	236.7	50.3
3	02.9	00.6	63	61.6	13.1	123	120.3	25.6	183	179.0	38.0	243	237.7	50.5
4	03.9	00.8	64	62.6	13.3	124	121.3	25.8	184	180.0	38.3	244	238.7	50.7
5	04.9	01.0	65	63.6	13.5	125	122.3	26.0	185	181.0	38.5	245	239.6	50.9
6	05.9	01.2	66	64.6	13.7	126	123.2	26.2	186	181.9	38.7	246	240.6	51.1
7	06.8	01.5	67	65.5	13.9	127	124.2	26.4	187	182.9	38.9	247	241.6	51.4
8	07.8	01.7	68	66.5	14.1	128	125.2	26.6	188	183.9	39.1	248	242.6	51.6
9	08.8	01.9	69	67.5	14.3	129	126.2	26.8	189	184.9	39.3	249	243.6	51.8
10	09.8	02.1	70	68.5	14.6	130	127.2	27.0	190	185.8	39.5	250	244.5	52.0
11	10.8	02.3	71	69.4	14.8	131	128.1	27.2	191	186.8	39.7	251	245.5	52 2
12	11.7	02.5	72	70.4	15.0	132	129.1	27.4	192	187.8	39.9	252	246.5	52.4
13	12.7	02.7	73	71.4	15.2	133	130.1	27.7	193	188.8	40.1	253	247.5	52.6
14	13.7	02.9	74	72.4	15.4	134	131.1	27.9	194	189.8	40.3	254	248.4	52.8
15	14.7	03.1	75	73.4	15.6	135	132.0	28.1	195	190.7	40.5	255	249.4	53.0
16	15.7	03.3	76	74.3	15.8	136	133.0	28.3	196	191.7	40.8	256	250.4	53.2
17	16.6	03.5	77	75.3	16.0	137	134.0	28.5	197	192.7	41.0	257	251.4	53.4
18	17.6	03.7	78	76.3	16.2	138	135.0	28.7	198	193.7	41.2	258	252.4	53.6
19	18.6	04.0	79	77.3	16.4	139	136.0	28.9	199	194.7	41.4	259	253.3	53.8
20	19.6	04.2	80	78.3	16.6	140	136.9	29.1	200	195.6	41.6	260	254.3	54.1
21	20.5	04.4	81	79.2	16.8	141	137.9	29.3	201	196.6	41.8	261	255.3	54.3
22	21.5	04.6	82	80.2	17.0	142	138.9	29.5	202	197.6	42.0	262	256.3	54.5
23	22.5	04.8	83	81.2	17.3	143	139.9	29.7	203	198.6	42.2	263	257.3	54.7
24	23.5	05.0	84	82.2	17.5	144	140.9	29.9	204	199.5	42.4	264	258.2	54.9
25	24.5	05.2	85	83.1	17.7	145	141.8	30.1	205	200.5	42.6	265	259.2	55.1
26	25.4	05.4	86	84.1	17.9	146	142 8	30.4	206	201.5	42.8	266	260.2	55.3
27	26.4	05.6	87	85.1	18.1	147	143.8	30.6	207	202.5	43.0	267	261.2	55.5
28	27.4	05.8	88	86.1	18.3	148	144.8	30.8	208	203.5	43.2	268	262.1	55.7
29	28.4	06.0	89	87.1	18.5	149	145.7	31.0	209	204.4	43.5	269	263.1	55.9
30	29.3	06.2	90	88.0	18.7	150	146.7	31.2	210	205.4	43.7	270	264.1	56.1
31	30.3	06.4	91	89.0	18.9	151	147.7	31.4	211	206.4	43.9	271	265.1	56.3
32	31.3	06.7	92	90.0	19.1	152	148.7	31.6	212	207.4	44.1	272	266.1	56.6
33	32.3	06.9	93	91.0	19.3	153	149.7	31.8	213	208.3	44.3	273	267.0	56.8
34	33.3	07.1	94	91.9	19.5	154	150.6	32.0	214	209.3	44.5	274	268.0	57.0
35	34.2	07.3	95	92.9	19.8	155	151.6	32.2	215	210.3	44.7	275	269.0	57.2
36	35.2	07.5	96	93.9	20.0	156	152.6	32.4	216	211.3	44.9	276	270.0	57.4
37	36.2	07.7	97	94.9	20.2	157	153.6	32.6	217	212.3	45.1	277	270.9	57.6
38	37.2	07.9	98	95.9	20.4	158	154.5	32.9	218	213.2	45.3	278	271.9	57.8
39	38.1	08.1	99	96.8	20.6	159	155.5	33.1	219	214.2	45.5	279	272.9	58.0
40	39.1	08.3	100	97.8	20.8	160	156.5	33.3	220	215.2	45.7	280	273.9	58.2
41	40.1	08.5	101	98.8	21.0	161	157.5	33.5	221	216.2	45.9	281	274.9	58.4
42	41.1	08.7	102	99.8	21.2	162	158.5	33.7	222	217.1	46.2	282	275.8	58.6
43	42.1	08.9	103	100.7	21.4	163	159.4	33.9	223	218.1	46.4	283	276.8	58.8
44	43.0	09.1	104	101.7	21.6	164	160.4	34.1	224	219.1	46.6	284	277.8	59.0
45	44.0	09.4	105	102.7	21.8	165	161.4	34.3	225	220.1	46.8	285	278.8	59.3
46	45.0	09.6	106	103.7	22.0	166	162.4	34.5	226	221.1	47.0	286	279.8	59.5
47	46.0	09.8	107	104.7	22.2	167	163.4	34.7	227	222.0	47.2	287	280.7	59.7
48	47.0	10.0	108	105.6	22.5	168	164.3	34.9	228	223.0	47.4	288	281.7	59.9
49	47.9	10.2	109	106.6	22.7	169	165.3	35.1	229	224.0	47.6	289	282.7	60.1
50	48.9	10.4	110	107.6	22.9	170	166.3	35.3	230	225.0	47.8	290	283.7	60.3
51	49.9	10.6	111	108.6	23.1	171	167.3	35.6	231	226.0	48.0	291	284.6	60.5
52	50.9	10.8	112	109.6	23.3	172	168.2	35.8	232	226.9	48.2	292	285.6	60.7
53	51.8	11.0	113	110.5	23.5	173	169.2	36.0	233	227.9	48.4	293	286.6	60.9
54	52.8	11.2	114	111.5	23.7	174	170.2	36.2	234	228.9	48.7	294	287.6	61.1
55	53.8	11.4	115	112.5	23.9	175	171.2	36.4	235	229.9	48.9	295	288.6	61.3
56	54.8	11.6	116	113.5	24.1	176	172.2	36.6	236	230.8	49.1	296	289.5	61.5
57	55.8	11.9	117	114.4	24.3	177	173.1	36.8	237	231.8	49.3	297	290.5	61.7
58	56.7	12.1	118	115.4	24.5	178	174.1	37.0	238	232.8	49.5	298	291.5	62.0
59	57.7	12.3	119	116.4	24.7	179	175.1	37.2	239	233.8	49.7	299	292.5	62.2
60	58.7	12.5	120	117.4	24.9	180	176.1	37.4	240	234.8	49.9	300	293.4	62.4
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 13 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.2	61	59.4	13.7	121	117.9	27.2	181	176.4	40.7	241	234.8	54.2
2	01.9	00.4	62	60.4	13.9	122	118.9	27.4	182	177.3	40.9	242	235.8	54.4
3	02.9	00.7	63	61.4	14.2	123	119.8	27.7	183	178.3	41.2	243	236.8	54.7
4	03.9	00.9	64	62.4	14.4	124	120.8	27.9	184	179.3	41.4	244	237.7	54.9
5	04.9	01.1	65	63.3	14.6	125	121.8	28.1	185	180.3	41.6	245	238.7	55.1
6	05.8	01.3	66	64.3	14.8	126	122.8	28.3	186	181.2	41.8	246	239.7	55.3
7	06.8	01.6	67	65.3	15.1	127	123.7	28.6	187	182.2	42.1	247	240.7	55.6
8	07.8	01.8	68	66.3	15.3	128	124.7	28.8	188	183.2	42.3	248	241.6	55.8
9	08.8	02.0	69	67.2	15.5	129	125.7	29.0	189	184.2	42.5	249	242.6	56.0
10	09.7	02.2	70	68.2	15.7	130	126.7	29.2	190	185.1	42.7	250	243.6	56.2
11	10.7	02.5	71	69.2	16.0	131	127.6	29.5	191	186.1	43.0	251	244.6	56.5
12	11.7	02.7	72	70.2	16.2	132	128.6	29.7	192	187.1	43.2	252	245.5	56 7
13	12.7	02.9	73	71.1	16.4	133	129.6	29.9	193	188.1	43.4	253	246.5	56.9
14	13.6	03.1	74	72.1	16.6	134	130.6	30.1	194	189.0	43.6	254	247.5	57.1
15	14.6	03.4	75	73.1	16.9	135	131.5	30.4	195	190.0	43.9	255	248.5	57.4
16	15.6	03.6	76	74.1	17.1	136	132.5	30.6	196	191.0	44.1	256	249.4	57.6
17	16.6	03.8	77	75.0	17.3	137	133.5	30.8	197	192.0	44.3	257	250.4	57.8
18	17.5	04.0	78	76.0	17.5	138	134.5	31.0	198	192.9	44.5	258	251.4	58.0
19	18.5	04.3	79	77.0	17.8	139	135.4	31.3	199	193.9	44.8	259	252.4	58.3
20	19.5	04.5	80	77.9	18.0	140	136.4	31.5	200	194.9	45.0	260	253.3	58.5
21	20.5	04.7	81	78.9	18.2	141	137.4	31.7	201	195.8	45.2	261	254.3	58.7
22	21.4	04.9	82	79.9	18.4	142	138.4	31.9	202	196.8	45.4	262	255.3	58.9
23	22.4	05.2	83	80.9	18.7	143	139.3	32.2	203	197.8	45.7	263	256.3	59.2
24	23.4	05.4	84	81.8	18.9	144	140.3	32.4	204	198.8	45.9	264	257.2	59.4
25	24.4	05.6	85	82.8	19.1	145	141.3	32.6	205	199.7	46.1	265	258.2	59.6
26	25.3	05.8	86	83.8	19.3	146	142.3	32.8	206	200.7	46.3	266	259.2	59.8
27	26.3	06.1	87	84.8	19.6	147	143.2	33.1	207	201.7	46.6	267	260.2	60.1
28	27.3	06.3	88	85.7	19.8	148	144.2	33.3	208	202.7	46.8	268	261.1	60.3
29	28.3	06.5	89	86.7	20.0	149	145.2	33.5	209	203.6	47.0	269	262.1	60.5
30	29.2	06.7	90	87.7	20.2	150	146.2	33.7	210	204.6	47.2	270	263.1	60.7
31	30.2	07.0	91	88.7	20.5	151	147.1	34.0	211	205.6	47.5	271	264.1	61.0
32	31.2	07.2	92	89.6	20.7	152	148.1	34.2	212	206.6	47.7	272	265.0	61.2
33	32.2	07.4	93	90 6	20.9	153	149.1	34.4	213	207.5	47.9	273	266.0	61.4
34	33.1	07.6	94	91 6	21.1	154	150.1	34.6	214	208.5	48.1	274	267.0	61.6
35	34.1	07.9	95	92 6	21.4	155	151.0	34.9	215	209.5	48.4	275	268.0	61.9
36	35.1	08.1	96	93.5	21.6	156	152.0	35.1	216	210.5	48.6	276	268.9	62.1
37	36.1	08.3	97	94.5	21.8	157	153.0	35.3	217	211.4	48.8	277	269.9	62.3
38	37.0	08.5	98	95.5	22.0	158	154.0	35.5	218	212.4	49.0	278	270.9	62.5
39	38.0	08.8	99	96.5	22.3	159	154.9	35.8	219	213.4	49.3	279	271.8	62.8
40	39.0	09.0	100	97.4	22.5	160	155.9	36.0	220	214.4	49.5	280	272.8	63.0
41	39.9	09.2	101	98.4	22.7	161	156.9	36.2	221	215.3	49.7	281	273.8	63.2
42	40.9	09.4	102	99.4	22.9	162	157.8	36.4	222	216.3	49.9	282	274.8	63.4
43	41.9	09.7	103	100.4	23.2	163	158.8	36.7	223	217.3	50.2	283	275.7	63.7
44	42.9	09.9	104	101.3	23.4	164	159.8	36.9	224	218.3	50.4	284	276.7	63.9
45	43.8	10.1	105	102.3	23.6	165	160.8	37.1	225	219.2	50.6	285	277.7	64.1
46	44.8	10.3	106	103.3	23.8	166	161.7	37.3	226	220.2	50.8	286	278.7	64.3
47	45.8	10.6	107	104.3	24.1	167	162.7	37.6	227	221.2	51.1	287	279.6	64.6
48	46.8	10.8	108	105.2	24.3	168	163.7	37.8	228	222.2	51.3	288	280.6	64.8
49	47.7	11.0	109	106.2	24.5	169	164.7	38.0	229	223.1	51.5	289	281.6	65.0
50	48.7	11.2	110	107.2	24.7	170	165.6	38.2	230	224.1	51.7	290	282.6	65.2
51	49.7	11.5	111	108.2	25.0	171	166.6	38.5	231	225.1	52.0	291	283.5	65.5
52	50 7	11.7	112	109.1	25.2	172	167.6	38.7	232	226.1	52.2	292	284.5	65.7
53	51.6	11.9	113	110.1	25.4	173	168.6	38.9	233	227.0	52.4	293	285.5	65.9
54	52.6	12.1	114	111.1	25.6	174	169.5	39.1	234	228.0	52.6	294	286.5	66.1
55	53.6	12.4	115	112.1	25.9	175	170.5	39.4	235	229.0	52.9	295	287.4	66.4
56	54.6	12.6	116	113.0	26.1	176	171.5	39.6	236	230.0	53.1	296	288.4	66.6
57	55.5	12.8	117	114.0	26.3	177	172 5	39.8	237	230.9	53.3	297	289.4	66.8
58	56.5	13.0	118	115.0	26.5	178	173.4	40.0	238	231.9	53.5	298	290.4	67.0
59	57.5	13.3	119	116.0	26.8	179	174.4	40.3	239	232.9	53.8	299	291.3	67.3
60	58.5	13.5	120	116.9	27.0	180	175.4	40.5	240	233.8	54.0	300	292.3	67.5
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 14 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.2	61	59.2	14.8	121	117.4	29.3	181	175.6	43.8	241	233.8	58.3
2	01.9	00.5	62	60.2	15.0	122	118.4	29.5	182	176.6	44.0	242	234.8	58.5
3	02.9	00.7	63	61.1	15.2	123	119.3	29.8	183	177.6	44.3	243	235.8	58.8
4	03.9	01.0	64	62.1	15.5	124	120.3	30.0	184	178.5	44.5	244	236.8	59.0
5	04.9	01.2	65	63.1	15.7	125	121.3	30.2	185	179.5	44.8	245	237.7	59.3
6	05.8	01.5	66	64.0	16.0	126	122.3	30.5	186	180.5	45.0	246	238.7	59.5
7	06.8	01.7	67	65.0	16.2	127	123.2	30.7	187	181.4	45.2	247	239.7	59.8
8	07.8	01.9	68	66 0	16.5	128	124.2	31.0	188	182.4	45.5	248	240.6	60.0
9	08.7	02.2	69	67.0	16.7	129	125.2	31.2	189	183.4	45.7	249	241.6	60.2
10	09.7	02.4	70	67.9	16.9	130	126.1	31.4	190	184.4	46.0	250	242.6	60.5
11	10.7	02.7	71	68.9	17.2	131	127.1	31.7	191	185.3	46.2	251	243.5	60.7
12	11.6	02.9	72	69.9	17.4	132	128.1	31.9	192	186.3	46.4	252	244.5	61.0
13	12.6	03.1	73	70.8	17.7	133	129.0	32.2	193	187.3	46.7	253	245.5	61.2
14	13.6	03.4	74	71.8	17.9	134	130.0	32.4	194	188.2	46.9	254	246.5	61.4
15	14.6	03.6	75	72.8	18.1	135	131.0	32.7	195	189.2	47.2	255	247.4	61.7
16	15.5	03.9	76	73.7	18.4	136	132.0	32.9	196	190.2	47.4	256	248.4	61.9
17	16.5	04.1	77	74.7	18.6	137	132.9	33.1	197	191.1	47.7	257	249.4	62.2
18	17.5	04.4	78	75.7	18.9	138	133.9	33.4	198	192.1	47.9	258	250.3	62.4
19	18.4	04.6	79	76.7	19.1	139	134.9	33.6	199	193.1	48.1	259	251.3	62.7
20	19.4	04.8	80	77.6	19.4	140	135.8	33.9	200	194.1	48.4	260	252.3	62.9
21	20.4	05.1	81	78.6	19.6	141	136.8	34.1	201	195.0	48.6	261	253.2	63.1
22	21.3	05.3	82	79.6	19.8	142	137.8	34.4	202	196.0	48.9	262	254.2	63.4
23	22.3	05.6	83	80.5	20.1	143	138.8	34.6	203	197.0	49.1	263	255.2	63.6
24	23.3	05.8	84	81.5	20.3	144	139.7	34.8	204	197.9	49.4	264	256.2	63.9
25	24.3	06.0	85	82.5	20.6	145	140.7	35.1	205	198.9	49.6	265	257.1	64.1
26	25.2	06.3	86	83.4	20.8	146	141.7	35.3	206	199.9	49.8	266	258.1	64.4
27	26.2	06.5	87	84.4	21.0	147	142.6	35.6	207	200.9	50.1	267	259.1	64.6
28	27.2	06.8	88	85.4	21.3	148	143.6	35.8	208	201.8	50.3	268	260.0	64.8
29	28.1	07.0	89	86.4	21.5	149	144.6	36.0	209	202.8	50.6	269	261.0	65.1
30	29.1	07.3	90	87.3	21.8	150	145.5	36.3	210	203.8	50.8	270	262.0	65.3
31	30.1	07.5	91	88.3	22.0	151	146.5	36.5	211	204.7	51.0	271	263.0	65.6
32	31.0	07.7	92	89.3	22.3	152	147.5	36.8	212	205.7	51.3	272	263.9	65.8
33	32.0	08.0	93	90.2	22.5	153	148.5	37.0	213	206.7	51.5	273	264.9	66.0
34	33.0	08.2	94	91.2	22.7	154	149.4	37.3	214	207.6	51.8	274	265.9	66.3
35	34.0	08.5	95	92.2	23.0	155	150.4	37.5	215	208.6	52.0	275	266.8	66.5
36	34.9	08.7	96	93.1	23.2	156	151.4	37.7	216	209.6	52.3	276	267.8	66.8
37	35.9	09.0	97	94.1	23.5	157	152.3	38.0	217	210.6	52.5	277	268.8	67.0
38	36.9	09.2	98	95.1	23.7	158	153.3	38.2	218	211.5	52.7	278	269.7	67.3
39	37.8	09.4	99	96.1	24.0	159	154.3	38.5	219	212.5	53.0	279	270.7	67.5
40	38.8	09.7	100	97.0	24.2	160	155.2	38.7	220	213.5	53.2	280	271.7	67.7
41	39.8	09.9	101	98.0	24.4	161	156.2	38.9	221	214.4	53.5	281	272.7	68.0
42	40.8	10.2	102	99.0	24.7	162	157.2	39.2	222	215.4	53.7	282	273.6	68.2
43	41.7	10.4	103	99.9	24.9	163	158.2	39.4	223	216.4	53.9	283	274.6	68.5
44	42.7	10.6	104	100.9	25.2	164	159.1	39.7	224	217.3	54.2	284	275.6	68.7
45	43.7	10.9	105	101.9	25.4	165	160.1	39.9	225	218.3	54.4	285	276.5	68.9
46	44.6	11.1	106	102.9	25.6	166	161.1	40.2	226	219.3	54.7	286	277.5	69.2
47	45.6	11.4	107	103.8	25.9	167	162.0	40.4	227	220.3	54.9	287	278.5	69.4
48	46.6	11.6	108	104.8	26.1	168	163.0	40.6	228	221.2	55.2	288	279.4	69.7
49	47.5	11.9	109	105.8	26.4	169	164.0	40.9	229	222.2	55.4	289	280.4	69.9
50	48.5	12.1	110	106.7	26.6	170	165.0	41.1	230	223.2	55.6	290	281.4	70.2
51	49.5	12.3	111	107.7	26.9	171	165.9	41.4	231	224.1	55.9	291	282.4	70.4
52	50.5	12.6	112	108.7	27.1	172	166.9	41.6	232	225.1	56.1	292	283.3	70.6
53	51.4	12.8	113	109.6	27.3	173	167.9	41.9	233	226.1	56.4	293	284.3	70.9
54	52.4	13.1	114	110.6	27.6	174	168.8	42.1	234	227.0	56.6	294	285.3	71.1
55	53 4	13.3	115	111.6	27.8	175	169.8	42.3	235	228.0	56.9	295	286.2	71.4
56	54 3	13.5	116	112.6	28.1	176	170.8	42.6	236	229.0	57.1	296	287.2	71.6
57	55.3	13.8	117	113.5	28.3	177	171.7	42.8	237	230.0	57.3	297	288.2	71.9
58	56.3	14.0	118	114.5	28.6	178	172.7	43.1	238	230.9	57.6	298	289.1	72.1
59	57.2	14.3	119	115.5	28.8	179	173.7	43.3	239	231.9	57.8	299	290.1	72.3
60	58.2	14.5	120	116.4	29.0	180	174.7	43.5	240	232.9	58.1	300	291.1	72.6
Dist	*Dep.*	*Lat.*	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 15 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.3	61	58.9	15.8	121	116.9	31.3	181	174.8	46.8	241	232.8	62.4
2	01.9	00.5	62	59.9	16.0	122	117.8	31.6	182	175.8	47.1	242	233.8	62.6
3	02.9	00.8	63	60.9	16.3	123	118.8	31.8	183	176.8	47.4	243	234.7	62.9
4	03.9	01.0	64	61.8	16.6	124	119.8	32.1	184	177.7	47.6	244	235.7	63.2
5	04.8	01.3	65	62.8	16.8	125	120.7	32.4	185	178.7	47.9	245	236.7	63.4
6	05.8	01.6	66	63.8	17.1	126	121.7	32.6	186	179.7	48.1	246	237.6	63.7
7	06.8	01.8	67	64.7	17.3	127	122.7	32.9	187	180.6	48.4	247	238.6	63.9
8	07.7	02.1	68	65.7	17.6	128	123.6	33.1	188	181.6	48.7	248	239.5	64.2
9	08.7	02.3	69	66.6	17.9	129	124.6	33.4	189	182.6	48.9	249	240.5	64.4
10	09.7	02.6	70	67.6	18.1	130	125.6	33.6	190	183.5	49.2	250	241.5	64.7
11	10.6	02.8	71	68.6	18.4	131	126.5	33.9	191	184.5	49.4	251	242.4	65.0
12	11.6	03.1	72	69.5	18.6	132	127.5	34.2	192	185.5	49.7	252	243.4	65.2
13	12.6	03.4	73	70.5	18.9	133	128.5	34.4	193	186.4	50.0	253	244.4	65.5
14	13.5	03.6	74	71.5	19.2	134	129.4	34.7	194	187.4	50.2	254	245.3	65.7
15	14.5	03.9	75	72.4	19.4	135	130.4	34.9	195	188.4	50.5	255	246.3	66.0
16	15.5	04.1	76	73.4	19.7	136	131.4	35.2	196	189.3	50.7	256	247.3	66.3
17	16.4	04.4	77	74.4	19.9	137	132.3	35.5	197	190.3	51.0	257	248.2	66.5
18	17.4	04.7	78	75.3	20.2	138	133.3	35.7	198	191.3	51.2	258	249.2	66.8
19	18.4	04.9	79	76.3	20.4	139	134.3	36.0	199	192.2	51.5	259	250.2	67.0
20	19.3	05.2	80	77.3	20.7	140	135.2	36.2	200	193.2	51.8	260	251.1	67.3
21	20.3	05.4	81	78.2	21.0	141	136.2	36.5	201	194.2	52.0	261	252.1	67.6
22	21.3	05.7	82	79.2	21.2	142	137.2	36.8	202	195.1	52.3	262	253.1	67.8
23	22.2	06.0	83	80.2	21.5	143	138.1	37.0	203	196.1	52.5	263	254.0	68.1
24	23.2	06.2	84	81 1	21.7	144	139.1	37.3	204	197.0	52.8	264	255.0	68.3
25	24.1	06.5	85	82.1	22.0	145	140.1	37.5	205	198.0	53.1	265	256.0	68.6
26	25.1	06.7	86	83.1	22.3	146	141.0	37.8	206	199.0	53.3	266	256.9	68.8
27	26.1	07.0	87	84.0	22.5	147	142.0	38.0	207	199.9	53.6	267	257.9	69.1
28	27.0	07.2	88	85.0	22.8	148	143.0	38.3	208	200.9	53.8	268	258.9	69.4
29	28.0	07.5	89	86.0	23.0	149	143.9	38.6	209	201.9	54.1	269	259.8	69.6
30	29.0	07.8	90	86.9	23.3	150	144.9	38.8	210	202.8	54.4	270	260.8	69.9
31	29.9	08.0	91	87.9	23.6	151	145.9	39.1	211	203.8	54.6	271	261.8	70 1
32	30.9	08.3	92	88.9	23.8	152	146.8	39.3	212	204.8	54.9	272	262.7	70.4
33	31.9	08.5	93	89.8	24.1	153	147.8	39.6	213	205.7	55.1	273	263.7	70.7
34	32.8	08.8	94	90.8	24.3	154	148.8	39.9	214	206.7	55.4	274	264.7	70.9
35	33.8	09.1	95	91.8	24.6	155	149.7	40.1	215	207.7	55.6	275	265.6	71.2
36	34.8	09.3	96	92.7	24.8	156	150.7	40.4	216	208.6	55.9	276	266.6	71.4
37	35.7	09.6	97	93.7	25.1	157	151.7	40.6	217	209.6	56.2	277	267.6	71.7
38	36.7	09.8	98	94.7	25.4	158	152.6	40.9	218	210.6	56.4	278	268.5	72.0
39	37.7	10.1	99	95.6	25.6	159	153.6	41.2	219	211.5	56.7	279	269.5	72.2
40	38.6	10.4	100	96.6	25.9	160	154.5	41.4	220	212.5	56.9	280	270.5	72.5
41	39.6	10.6	101	97.6	26.1	161	155.5	41.7	221	213.5	57.2	281	271.4	72.7
42	40.6	10.9	102	98.5	26.4	162	156.5	41.9	222	214.4	57.5	282	272.4	73.0
43	41.5	11.1	103	99.5	26.7	163	157.4	42.2	223	215.4	57.7	283	273.4	73.2
44	42.5	11.4	104	100.5	26.9	164	158.4	42.4	224	216.4	58.0	284	274.3	73.5
45	43.5	11.6	105	101.4	27.2	165	159.4	42.7	225	217.3	58.2	285	275.3	73.8
46	44.4	11.9	106	102.4	27.4	166	160.3	43.0	226	218.3	58.5	286	276.3	74.0
47	45.4	12.2	107	103.4	27 7	167	161.3	43.2	227	219.3	58.8	287	277.2	74.3
48	46.4	12.4	108	104.3	28 0	168	162.3	43.5	228	220.2	59.0	288	278.2	74.5
49	47.3	12.7	109	105.3	28.2	169	163.2	43.7	229	221.2	59.3	289	279.2	74.8
50	48.3	12.9	110	106.3	28.5	170	164.2	44.0	230	222.2	59.5	290	280.1	75.1
51	49.3	13.2	111	107.2	28.7	171	165.2	44.3	231	223.1	59.8	291	281.1	75.3
52	50.2	13.5	112	108.2	29.0	172	166.1	44.5	232	224.1	60.0	292	282.1	75.6
53	51.2	13.7	113	109.1	29.2	173	167.1	44.8	233	225.1	60.3	293	283.0	75.8
54	52.2	14.0	114	110.1	29.5	174	168.1	45.0	234	226.0	60.6	294	284.0	76.1
55	53.1	14.2	115	111.1	29.8	175	169.0	45.3	235	227.0	60.8	295	284.9	76.4
56	54.1	14.5	116	112.0	30.0	176	170.0	45.6	236	228.0	61.1	296	285.9	76.6
57	55.1	14.8	117	113.0	30.3	177	171.0	45.8	237	228.9	61.3	297	286.9	76.9
58	56.0	15.0	118	114.0	30.5	178	171.9	46.1	238	229.9	61.6	298	287.8	77.1
59	57.0	15.3	119	114.9	30.8	179	172.9	46.3	239	230.9	61.9	299	288.8	77.4
60	58.0	15.5	120	115.9	31.1	180	173.9	46.6	240	231.8	62.1	300	289.8	77.6
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 75 Degrees.

Difference of Latitude and Departure for 16 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.3	61	58.6	16.8	121	116.3	33.4	181	174.0	49.9	241	231.7	66.4
2	01.9	00.6	62	59.6	17.1	122	117.3	33.6	182	174.9	50.2	242	232.6	66.7
3	02.9	00.8	63	60.6	17.4	123	118.2	33.9	183	175.9	50.4	243	233.6	67.0
4	03.8	01.1	64	61.5	17.6	124	119.2	34.2	184	176.9	50.7	244	234.5	67.3
5	04.8	01.4	65	62.5	17.9	125	120.2	34.5	185	177.8	51.0	245	235.5	67.5
6	05.8	01.7	66	63.4	18.2	126	121.1	34.7	186	178.8	51.3	246	236.5	67.8
7	06.7	01.9	67	64.4	18.5	127	122.1	35.0	187	179.8	51.5	247	237.4	68.1
8	07.7	02.2	68	65.4	18.7	128	123.0	35.3	188	180.7	51.8	248	238.4	68.4
9	08.7	02.5	69	66.3	19.0	129	124.0	35.6	189	181.7	52.1	249	239.4	68.6
10	09.6	02.8	70	67.3	19.3	130	125.0	35.8	190	182.6	52.4	250	240.3	68.9
11	10.6	03.0	71	68.2	19.6	131	125.9	36.1	191	183.6	52.6	251	241.3	69.2
12	11.5	03.3	72	69.2	19.8	132	126.9	36.4	192	184.6	52.9	252	242.2	69.5
13	12.5	03.6	73	70.2	20.1	133	127.8	36.7	193	185.5	53.2	253	243.2	69.7
14	13.5	03.9	74	71.1	20.4	134	128.8	36.9	194	186.5	53.5	254	244.2	70.0
15	14.4	04.1	75	72.1	20.7	135	129.8	37.2	195	187.4	53.7	255	245.1	70.3
16	15.4	04.4	76	73.1	20.9	136	130.7	37.5	196	188.4	54.0	256	246.1	70.6
17	16.3	04.7	77	74.0	21.2	137	131.7	37.8	197	189.4	54.3	257	247.0	70.8
18	17.3	05.0	78	75.0	21.5	138	132.7	38.0	198	190.3	54.6	258	248.0	71.1
19	18.3	05.2	79	75.9	21.8	139	133.6	38.3	199	191.3	54.9	259	249.0	71.4
20	19.2	05.5	80	76.9	22.1	140	134.6	38.6	200	192.3	55.1	260	249.9	71.7
21	20.2	05.8	81	77.9	22.3	141	135.5	38.9	201	193.2	55.4	261	250.9	71.9
22	21.1	06.1	82	78.8	22.6	142	136.5	39.1	202	194.2	55.7	262	251.9	72.2
23	22.1	06.3	83	79.8	22.9	143	137.5	39.4	203	195.1	56.0	263	252.8	72.5
24	23.1	06.6	84	80.7	23.2	144	138.4	39.7	204	196.1	56.2	264	253.8	72.8
25	24.0	06.9	85	81.7	23.4	145	139.4	40.0	205	197.1	56.5	265	254.7	73.0
26	25.0	07.2	86	82.7	23.7	146	140.3	40.2	206	198.0	56.8	266	255.7	73.3
27	26.0	07.4	87	83.6	24.0	147	141.3	40.5	207	199.0	57.1	267	256.7	73.6
28	26.9	07.7	88	84.6	24.3	148	142.3	40.8	208	199.9	57.3	268	257.6	73.9
29	27.9	08.0	89	85.6	24.5	149	143.2	41.1	209	200.9	57.6	269	258.6	74.1
30	28.8	08.3	90	86.5	24.8	150	144.2	41.3	210	201.9	57.9	270	259.5	74.4
31	29.8	08.5	91	87.5	25.1	151	145.2	41.6	211	202.8	58.2	271	260.5	74.7
32	30.8	08.8	92	88.4	25.4	152	146.1	41.9	212	203.8	58.4	272	261.5	75.0
33	31.7	09.1	93	89.4	25.6	153	147.1	42.2	213	204.7	58.7	273	262.4	75.2
34	32.7	09.4	94	90.4	25.9	154	148.0	42.4	214	205.7	59.0	274	263.4	75.5
35	33.6	09.6	95	91.3	26.2	155	149.0	42.7	215	206.7	59.3	275	264.3	75.8
36	34.6	09.9	96	92.3	26.5	156	150.0	43.0	216	207.6	59.5	276	265.3	76.1
37	35.6	10.2	97	93.2	26.7	157	150.9	43.3	217	208.6	59.8	277	266.3	76.4
38	36.5	10.5	98	94.2	27.0	158	151.9	43.6	218	209.6	60.1	278	267.2	76.6
39	37.5	10.7	99	95.2	27.3	159	152.8	43.8	219	210.5	60.4	279	268.2	76.9
40	38.5	11.0	100	96.1	27.6	160	153.8	44.1	220	211.5	60.6	280	269.2	77.2
41	39.4	11.3	101	97.1	27.8	161	154.8	44.4	221	212.4	60.9	281	270.1	77.5
42	40.4	11.6	102	98.0	28.1	162	155.7	44.7	222	213.4	61.2	282	271.1	77.7
43	41.3	11.9	103	99.0	28.4	163	156.7	44.9	223	214.4	61.5	283	272.0	78.0
44	42.3	12.1	104	100.0	28.7	164	157.6	45.2	224	215.3	61.7	284	273.0	78.3
45	43.3	12.4	105	100.9	28.9	165	158.6	45.5	225	216.3	62.0	285	274.0	78.6
46	44.2	12.7	106	101.9	29.2	166	159.6	45.8	226	217.2	62.3	286	274.9	78.8
47	45.2	13.0	107	102.9	29.5	167	160.5	46.0	227	218.2	62.6	287	275.9	79.1
48	46.1	13.2	108	103.8	29.8	168	161.5	46.3	228	219.2	62.8	288	276.8	79.4
49	47.1	13.5	109	104.8	30.0	169	162.5	46.6	229	220.1	63.1	289	277.8	79.7
50	48.1	13.8	110	105.7	30.3	170	163.4	46.9	230	221.1	63.4	290	278.8	79.9
51	49.0	14.1	111	106.7	30.6	171	164.4	47.1	231	222.1	63.7	291	279.7	80.2
52	50.0	14.3	112	107.7	30.9	172	165.3	47.4	232	223.0	63.9	292	280.7	80.5
53	50.9	14.6	113	108.6	31.1	173	166.3	47.7	233	224.0	64.2	293	281.6	80.8
54	51.9	14.9	114	109.6	31.4	174	167.3	48.0	234	224.9	64.5	294	282.6	81.0
55	52.9	15.2	115	110.5	31.7	175	168.2	48.2	235	225.9	64.8	295	283.6	81.3
56	53.8	15.4	116	111.5	32.0	176	169.2	48.5	236	226.9	65.1	296	284.5	81.6
57	54.8	15.7	117	112.5	32.2	177	170.1	48.8	237	227.8	65.3	297	285.5	81.9
58	55.8	16.0	118	113.4	32.5	178	171.1	49.1	238	228.8	65.6	298	286.5	82.1
59	56.7	16.3	119	114.4	32.8	179	172.1	49.3	239	229.7	65.9	299	287.4	82.4
60	57.7	16.5	120	115.4	33.1	180	173.0	49.6	240	230.7	66.2	300	288.4	82.7
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat

for 74 Degrees.

Difference of Latitude and Departure for 17 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.3	61	58.3	17.8	121	115.7	35.4	181	173.1	52.9	241	230.5	70.5
2	01.9	00.6	62	59.3	18.1	122	116.7	35.7	182	174.0	53.2	242	231.4	70.8
3	02.9	00.9	63	60.2	18.4	123	117.6	36.0	183	175.0	53.5	243	232.4	71.0
4	03.8	01.2	64	61.2	18.7	124	118.6	36.3	184	176.0	53.8	244	233.3	71.3
5	04.8	01.5	65	62.2	19.0	125	119.5	36.5	185	176.9	54.1	245	234.3	71.6
6	05.7	01.8	66	63.1	19.3	126	120.5	36.8	186	177.9	54.4	246	235.3	71.9
7	06.7	02.0	67	64.1	19.6	127	121.5	37.1	187	178.8	54.7	247	236.2	72.2
8	07.7	02.3	68	65.0	19.9	128	122.4	37.4	188	179.8	55.0	248	237.2	72.5
9	08.6	02.6	69	66.0	20.2	129	123.4	37.7	189	180.7	55.3	249	238.1	72.8
10	09.6	02.9	70	66.9	20.5	130	124.3	38.0	190	181.7	55.6	250	239.1	73.1
11	10.5	03.2	71	67.9	20.8	131	125.3	38.3	191	182.7	55.8	251	240.0	73.4
12	11.5	03.5	72	68.9	21.1	132	126.2	38.6	192	183.6	56.1	252	241.0	73.7
13	12.4	03.8	73	69.8	21.3	133	127.2	38.9	193	184.6	56.4	253	241.9	74.0
14	13.4	04.1	74	70.8	21.6	134	128.1	39.2	194	185.5	56.7	254	242.9	74.3
15	14.3	04.4	75	71.7	21.9	135	129.1	39.5	195	186.5	57.0	255	243.9	74.6
16	15.3	04.7	76	72.7	22.2	136	130.1	39.8	196	187.4	57.3	256	244.8	74.8
17	16.3	05.0	77	73.6	22.5	137	131.0	40.1	197	188.4	57.6	257	245.8	75.1
18	17.2	05.3	78	74.6	22.8	138	132.0	40.3	198	189.3	57.9	258	246.7	75.4
19	18.2	05.6	79	75.5	23.1	139	132.9	40.6	199	190.3	58.2	259	247.7	75.7
20	19.1	05.8	80	76.5	23.4	140	133.9	40.9	200	191.3	58.5	260	248.6	76.0
21	20.1	06.1	81	77.5	23.7	141	134.8	41.2	201	192.2	58.8	261	249.6	76.3
22	21.0	06.4	82	78.4	24.0	142	135.8	41.5	202	193.2	59.1	262	250.6	76.6
23	22.0	06.7	83	79.4	24.3	143	136.8	41 8	203	194.1	59.4	263	251.5	76.9
24	23.0	07.0	84	80.3	24.6	144	137.7	42.1	204	195.1	59.6	264	252.5	77.2
25	23.9	07.3	85	81.3	24.9	145	138.7	42.4	205	196.0	59.9	265	253.4	77.5
26	24.9	07.6	86	82.2	25.1	146	139.6	42.7	206	197.0	60.2	266	254.4	77.8
27	25.8	07.9	87	83.2	25.4	147	140.6	43.0	207	198.0	60.5	267	255.3	78.1
28	26.8	08.2	88	84.2	25.7	148	141.5	43.3	208	198.9	60.8	268	256.3	78.4
29	27.7	08.5	89	85.1	26.0	149	142.5	43.6	209	199.9	61.1	269	257.2	78.6
30	28.7	08.8	90	86.1	26.3	150	143.4	43.9	210	200.8	61.4	270	258.2	78.9
31	29.6	09.1	91	87.0	26.6	151	144.4	44.1	211	201.8	61.7	271	259.2	79.2
32	30.6	09.4	92	88.0	26.9	152	145.4	44.4	212	202.7	62.0	272	260.1	79.5
33	31.6	09.6	93	88.9	27.2	153	146.3	44.7	213	203.7	62.3	273	261.1	79.8
34	32.5	09.9	94	89.9	27.5	154	147.3	45.0	214	204.6	62.6	274	262.0	80.1
35	33.5	10.2	95	90.8	27.8	155	148.2	45.3	215	205.6	62.9	275	263.0	80.4
36	34.4	10.5	96	91.8	28.1	156	149.2	45.6	216	206.6	63.2	276	263.9	80.7
37	35.4	10.8	97	92.8	28.4	157	150.1	45.9	217	207.5	63.4	277	264.9	81.0
38	36.3	11.1	98	93.7	28.7	158	151.1	46.2	218	208.5	63.7	278	265.9	81.3
39	37.3	11.4	99	94.7	28.9	159	152.1	46.5	219	209.4	64.0	279	266.8	81.6
40	38.3	11.7	100	95.6	29.2	160	153.0	46.8	220	210.4	64.3	280	267.8	81.9
41	39.2	12.0	101	96.6	29.5	161	154.0	47.1	221	211.3	64.6	281	268.7	82.2
42	40.2	12.3	102	97.5	29.8	162	154.9	47.4	222	212.3	64.9	282	269.7	82.4
43	41.1	12.6	103	98.5	30.1	163	155.9	47.7	223	213.3	65.2	283	270.6	82.7
44	42.1	12.9	104	99.5	30.4	164	156.8	47.9	224	214.2	65.5	284	271 6	83.0
45	43.0	13.2	105	100.4	30.7	165	157.8	48.2	225	215.2	65.8	285	272.5	83.3
46	44.0	13.4	106	101.4	31.0	166	158.7	48.5	226	216.1	66.1	286	273.5	83.6
47	44.9	13.7	107	102.3	31.3	167	159.7	48.8	227	217.1	66.4	287	274.5	83.9
48	45.9	14.0	108	103.3	31.6	168	160.7	49.1	228	218.0	66.7	288	275.4	84.2
49	46.9	14.3	109	104.2	31.9	169	161.6	49.4	229	219.0	67.0	289	276.4	84.5
50	47.8	14.6	110	105.2	32.2	170	162.6	49.7	230	220.0	67.2	290	277.3	84.8
51	48.8	14.9	111	106.1	32.5	171	163.5	50.0	231	220.9	67.5	291	278.3	85.1
52	49.7	15.2	112	107.1	32.7	172	164.5	50.3	232	221.9	67.8	292	279.2	85.4
53	50.7	15.5	113	108.1	33.0	173	165.4	50.6	233	222.8	68.1	293	280.2	85.7
54	51.6	15.8	114	109.0	33.3	174	166.4	50.9	234	223.8	68.4	294	281.2	86.0
55	52.6	16.1	115	110.0	33.6	175	167.4	51.2	235	224.7	68.7	295	282.1	86.2
56	53.6	16.4	116	110.9	33.9	176	168.3	51.5	236	225.7	69.0	296	283.1	86.5
57	54.5	16.7	117	111.9	34.2	177	169.3	51.7	237	226.6	69 3	297	284.0	86.8
58	55.5	17.0	118	112.8	34.5	178	170.2	52.0	238	227.6	69.6	298	285.0	87.1
59	56.4	17.2	119	113.8	34.8	179	171.2	52.3	239	228.6	69.9	299	285.9	87.4
60	57.4	17.5	120	114.8	35.1	180	172.1	52.6	240	229.5	70.2	300	286.9	87.7
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 18 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	01.0	00.3	61	58.0	18.9	121	115.1	37.4	181	172.1	55.9	241	229.2	74.5
2	01.9	00.6	62	59.0	19.2	122	116.0	37.7	182	173.1	56.2	242	230.2	74.8
3	02.9	00.9	63	59.9	19.5	123	117.0	38.0	183	174.0	56 6	243	231.1	75.1
4	03.8	01.2	64	60.9	19.8	124	117.9	38.3	184	175.0	56.9	244	232.1	75.4
5	04.8	01.5	65	61.8	20.1	125	118.9	38.6	185	175.9	57.2	245	233.0	75 7
6	05.7	01.9	66	62.8	20.4	126	119.8	38.9	186	176.9	57.5	246	234.0	76.0
7	06.7	02.2	67	63.7	20.7	127	120.8	39.2	187	177.8	57.8	247	234.9	76.3
8	07.6	02.5	68	64.7	21.0	128	121.7	39.6	188	178.8	58.1	248	235.9	76.6
9	08.6	02.8	69	65.6	21.3	129	122.7	39.9	189	179.7	58.4	249	236.8	76.9
10	09.5	03.1	70	66.6	21.6	130	123.6	40.2	190	180.7	58.7	250	237.8	77.3
11	10.5	03.4	71	67.5	21.9	131	124.6	40.5	191	181.7	59.0	251	238.7	77.6
12	11.4	03.7	72	68.5	22.2	132	125.5	40.8	192	182.6	59.3	252	239.7	77 9
13	12.4	04.0	73	69.4	22.5	133	126.5	41.1	193	183.6	59.6	253	240.6	78.2
14	13.3	04.3	74	70.4	22.9	134	127.4	41.4	194	184.5	59.9	254	241.6	78.5
15	14.3	04.6	75	71.3	23.2	135	128.4	41.7	195	185.5	60.3	255	242.5	78.8
16	15.2	04.9	76	72.3	23.5	136	129.3	42.0	196	186.4	60.6	256	243.5	79.1
17	16.2	05.3	77	73.2	23.8	137	130.3	42.3	197	187.4	60.9	257	244.4	79.4
18	17.1	05.6	78	74.2	24.1	138	131.2	42.6	198	188.3	61.2	258	245.4	79.7
19	18.1	05.9	79	75.1	24.4	139	132.2	43.0	199	189.3	61.5	259	246.3	80.0
20	19.0	06.2	80	76.1	24.7	140	133.1	43.3	200	190.2	61.8	260	247.3	80.3
21	20.0	06.5	81	77.0	25.0	141	134.1	43.6	201	191.2	62.1	261	248.2	80.7
22	20.9	06.8	82	78.0	25.3	142	135.1	43.9	202	192.1	62.4	262	249.2	81.0
23	21.9	07.1	83	78.9	25.6	143	136.0	44.2	203	193.1	62.7	263	250.1	81.3
24	22.8	07.4	84	79.9	26.0	144	137.0	44.5	204	194.0	63.0	264	251.1	81.6
25	23.8	07.7	85	80.8	26.3	145	137.9	44.8	205	195.0	63.3	265	252.0	81.9
26	24.7	08.0	86	81.8	26.6	146	138.9	45.1	206	195.9	63.7	266	253.0	82.2
27	25.7	08.3	87	82.7	26.9	147	139.8	45.4	207	196.9	64.0	267	253.9	82.5
28	26.6	08.7	88	83.7	27.2	148	140.8	45.7	208	197.8	64.3	268	254.9	82.8
29	27.6	09.0	89	84.6	27.5	149	141.7	46.0	209	198.8	64.6	269	255.8	83.1
30	28.5	09.3	90	85.6	27.8	150	142.7	46.4	210	199.7	64.9	270	256.8	83.4
31	29.5	09.6	91	86.5	28.1	151	143.6	46.7	211	200.7	65.2	271	257.7	83.7
32	30.4	09.9	92	87.5	28.4	152	144.6	47.0	212	201.6	65.5	272	258.7	84.1
33	31.4	10.2	93	88.4	28.7	153	145.5	47.3	213	202.6	65.8	273	259.6	84.4
34	32.3	10.5	94	89.4	29.0	154	146.5	47.6	214	203.5	66.1	274	260.6	84.7
35	33.3	10.8	95	90.4	29.4	155	147.4	47 9	215	204.5	66.4	275	261.5	85.0
36	34.2	11.1	96	91.3	29.7	156	148.4	48.2	216	205.4	66.7	276	262.5	85.3
37	35.2	11.4	97	92.3	30.0	157	149.3	48.5	217	206.4	67.1	277	263.4	85.6
38	36.1	11.7	98	93.2	30.3	158	150.3	48.8	218	207.3	67.4	278	264.4	85.9
39	37.1	12.1	99	94.2	30.6	159	151.2	49.1	219	208.3	67.7	279	265.3	86.2
40	38.0	12.4	100	95.1	30.9	160	152.2	49.4	220	209.2	68.0	280	266.3	86.5
41	39.0	12.7	101	96.1	31.2	161	153.1	49.8	221	210.2	68.3	281	267.2	86.8
42	39.9	13.0	102	97.0	31.5	162	154.1	50.1	222	211.1	68.6	282	268.2	87.1
43	40.9	13.3	103	98.0	31.8	163	155.0	50.4	223	212.1	68.9	283	269.1	87.5
44	41.8	13.6	104	98.9	32.1	164	156.0	50.7	224	213.0	69.2	284	270.1	87.8
45	42.8	13.9	105	99.9	32.4	165	156.9	51.0	225	214.0	69.5	285	271.1	88 1
46	43.7	14.2	106	100.8	32.8	166	157.9	51.3	226	214.9	69.8	286	272.0	88.4
47	44.7	14.5	107	101.8	33.1	167	158.8	51 6	227	215.9	70.1	287	273.0	88.7
48	45.7	14.8	108	102.7	33.4	168	159.8	51.9	228	216.8	70.5	288	273.9	89.0
49	46.6	15.1	109	103.7	33.7	169	160.7	52.2	229	217.8	70.8	289	274.9	89.3
50	47.6	15.5	110	104.6	34.0	170	161.7	52.5	230	218.7	71.1	290	275.8	89.6
51	48.5	15.8	111	105.6	34.3	171	162.6	52.8	231	219.7	71.4	291	276.8	89.9
52	49.5	16.1	112	106.5	34.6	172	163.6	53.2	232	220.6	71.7	292	277.7	90.2
53	50.4	16.4	113	107.5	34.9	173	164.5	53 5	233	221.6	72.0	293	278.7	90.5
54	51.4	16.7	114	108.4	35.2	174	165.5	53.8	234	222.5	72.3	294	279.6	90.9
55	52.3	17.0	115	109.4	35.5	175	166.4	54.1	235	223.5	72.6	295	280.6	91.2
56	53.3	17.3	116	110.3	35.8	176	167.4	54.4	236	224.4	72.9	296	281.5	91.5
57	54.2	17.6	117	111.3	36.2	177	168.3	54.7	237	225.4	73.2	297	282.5	91.8
58	55.2	17.9	118	112.2	36.5	178	169.3	55.0	238	226.4	73.5	298	283.4	92.1
59	56.1	18.2	119	113.2	36.8	179	170.2	55.3	239	227.3	73.9	299	284.4	92.4
60	57.1	18.5	120	114 1	37.1	180	171.2	55.6	240	228.3	74.2	300	285.3	92.7
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 72 Degrees.

Difference of Latitude and Departure for 19 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.3	61	57.7	19.9	121	114.4	39.4	181	171.1	58.9	241	227.9	78.5
2	01.9	00.7	62	58.6	20.2	122	115.4	39.7	182	172.1	59.3	242	228.8	78.8
3	02.8	01.0	63	59.6	20.5	123	116.3	40.0	183	173.0	59.6	243	229.8	79.1
4	03.8	01.3	64	60.5	20.8	124	117.2	40.4	184	174.0	59.9	244	230.7	79.4
5	04.7	01.6	65	61.5	21.2	125	118.2	40.7	185	174.9	60.2	245	231.7	79.8
6	05.7	02.0	66	62.4	21.5	126	119.1	41.0	186	175.9	60.6	246	232.6	80.1
7	06.6	02.3	67	63.3	21.8	127	120.1	41.3	187	176.8	60.9	247	233.5	80.4
8	07.6	02.6	68	64.3	22.1	128	121.0	41.7	188	177.8	61.2	248	234.5	80.7
9	08.5	02.9	69	65.2	22.5	129	122.0	42.0	189	178.7	61.5	249	235.4	81.1
10	09.5	03.3	70	66.2	22.8	130	122.9	42.3	190	179.6	61.9	250	236.4	81.4
11	10.4	03.6	71	67.1	23.1	131	123.9	42.6	191	180.6	62.2	251	237.3	81.7
12	11.3	03.9	72	68.1	23.4	132	124.8	43.0	192	181.5	62.5	252	238.3	82.0
13	12.3	04.2	73	69.0	23.8	133	125.8	43.3	193	182.5	62.8	253	239.2	82.4
14	13.2	04.6	74	70.0	24.1	134	126.7	43.6	194	183.4	63.2	254	240.2	82.7
15	14.2	04.9	75	70.9	24.4	135	127.6	44.0	195	184.4	63.5	255	241.1	83.0
16	15.1	05.2	76	71.9	24.7	136	128.6	44.3	196	185.3	63.8	256	242.1	83.3
17	16.1	05.5	77	72.8	25.1	137	129.5	44.6	197	186.3	64.1	257	243.0	83.7
18	17.0	05.9	78	73.8	25.4	138	130.5	44.9	198	187.2	64.5	258	243.9	84.0
19	18.0	06.2	79	74.7	25.7	139	131.4	45.3	199	188.2	64.8	259	244.9	84.3
20	18.9	06.5	80	75.6	26.0	140	132.4	45.6	200	189.1	65.1	260	245.8	84.6
21	19.9	06.8	81	76.6	26.4	141	133.3	45.9	201	190.0	65.4	261	246.8	85.0
22	20.8	07.2	82	77.5	26.7	142	134.3	46.2	202	191.0	65.8	262	247.7	85.3
23	21.7	07.5	83	78.5	27.0	143	135.2	46.6	203	191.9	66.1	263	248.7	85.6
24	22.7	07.8	84	79.4	27.3	144	136.2	46.9	204	192.9	66.4	264	249.6	86.0
25	23.6	08.1	85	80.4	27.7	145	137.1	47.2	205	193.8	66.7	265	250.6	86.3
26	24.6	08.5	86	81.3	28.0	146	138.0	47.5	206	194.8	67.1	266	251.5	86.6
27	25.5	08.8	87	82.3	28.3	147	139.0	47.9	207	195.7	67.4	267	252.5	86.9
28	26.5	09.1	88	83.2	28.7	148	139.9	48.2	208	196.7	67.7	268	253.4	87.3
29	27.4	09.4	89	84.2	29.0	149	140.9	48.5	209	197.6	68.0	269	254.3	87.6
30	28.4	09.8	90	85.1	29.3	150	141.8	48.8	210	198.6	68.4	270	255.3	87.9
31	29.3	10.1	91	86.0	29.6	151	142.8	49.2	211	199.5	68.7	271	256.2	88.2
32	30.3	10.4	92	87.0	30.0	152	143.7	49.5	212	200.4	69.0	272	257.2	88.6
33	31.2	10.7	93	87.9	30.3	153	144.7	49.8	213	201.4	69.3	273	258.1	88.9
34	32.1	11.1	94	88.9	30.6	154	145.6	50.1	214	202.3	69.7	274	259.1	89.2
35	33.1	11.4	95	89.8	30.9	155	146.6	50.5	215	203.3	70.0	275	260.0	89.5
36	34.0	11.7	96	90.8	31.3	156	147.5	50.8	216	204.2	70.3	276	261.0	89.9
37	35 0	12.0	97	91.7	31.6	157	148.4	51.1	217	205.2	70.6	277	261.9	90.2
38	35.9	12.4	98	92.7	31.9	158	149.4	51.4	218	206.1	71.0	278	262.9	90.5
39	36.9	12.7	99	93.6	32.2	159	150.3	51.8	219	207.1	71.3	279	263.8	90.8
40	37.8	13.0	100	94.6	32.6	160	151.3	52.1	220	208.0	71.6	280	264.7	91.2
41	38.8	13.3	101	95.5	32.9	161	152.2	52.4	221	209.0	72.0	281	265.7	91.5
42	39.7	13.7	102	96.4	33.2	162	153.2	52.7	222	209.9	72.3	282	266.6	91.8
43	40.7	14.0	103	97.4	33.5	163	154.1	53.1	223	210.9	72.6	283	267.6	92.1
44	41.6	14.3	104	98.3	33.9	164	155.1	53.4	224	211.8	72.9	284	268.5	92.5
45	42.5	14.7	105	99.3	34.2	165	156.0	53.7	225	212.7	73.3	285	269.5	92.8
46	43.5	15.0	106	100.2	34.5	166	157.0	54.0	226	213.7	73.6	286	270.4	93.1
47	44.4	15.3	107	101.2	34.8	167	157.9	54.4	227	214.6	73.9	287	271.4	93.4
48	45.4	15.6	108	102.1	35.2	168	158.8	54.7	228	215.6	74.2	288	272.3	93.8
49	46.3	16.0	109	103.1	35.5	169	159.8	55.0	229	216.5	74 6	289	273.3	94.1
50	47.3	16.3	110	104.0	35.8	170	160.7	55.3	230	217.5	74.9	290	274.2	94.4
51	48.2	16.6	111	105.0	36.1	171	161.7	55.7	231	218.4	75.2	291	275.1	94.7
52	49.2	16.9	112	105.9	36.5	172	162.6	56.0	232	219.4	75.5	292	276.1	95.1
53	50.1	17.3	113	106.8	36.8	173	163.6	56.3	233	220.3	75.9	293	277.0	95.4
54	51.1	17.6	114	107.8	37.1	174	164.5	56.6	234	221.3	76.2	294	278.0	95.7
55	52.0	17.9	115	108.7	37.4	175	165.5	57.0	235	222.2	76.5	295	278.9	96.0
56	52.9	18.2	116	109.7	37.8	176	166.4	57.3	236	223.1	76.8	296	279.9	96.4
57	53.9	18.6	117	110.6	38.1	177	167.4	57.6	237	224.1	77.2	297	280.8	96.7
58	54.8	18.9	118	111.6	38.4	178	168.3	58.0	238	225.0	77.5	298	281.8	97.0
59	55.8	19.2	119	112.5	38.7	179	169.2	58.3	239	226.0	77.8	299	282.7	97.3
60	56.7	19.5	120	113.5	39.1	180	170.2	58.6	240	226.9	78.1	300	283.7	97.7
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 20 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.3	61	57.3	20.9	121	113.7	41.4	181	170.1	61.9	241	226.5	82.4
2	01.9	00.7	62	58.3	21.2	122	114.6	41.7	182	171.0	62.2	242	227.4	82.8
3	02.8	01.0	63	59.2	21.5	123	115.6	42.1	183	172.0	62.6	243	228.3	83.1
4	03.8	01.4	64	60.1	21.9	124	116.5	42.4	184	172.9	62.9	244	229.3	83.5
5	04.7	01.7	65	61.1	22.2	125	117.5	42.8	185	173.8	63.3	245	230.2	83.8
6	05.6	02.1	66	62.0	22.6	126	118.4	43.1	186	174.8	63.6	246	231.2	84.1
7	06.6	02.4	67	63.0	22.9	127	119.3	43.4	187	175.7	64.0	247	232.1	84.5
8	07.5	02.7	68	63.9	23.3	128	120.3	43.8	188	176.7	64.3	248	233.0	84.8
9	08.5	03.1	69	64.8	23.6	129	121.2	44.1	189	177.6	64.6	249	234.0	85.2
10	09.4	03.4	70	65.8	23.9	130	122.2	44.5	190	178.5	65.0	250	234.9	85.5
11	10.3	03.8	71	66.7	24.3	131	123.1	44.8	191	179.5	65.3	251	235.9	85.8
12	11.3	04.1	72	67.7	24.6	132	124.0	45.1	192	180.4	65.7	252	236.8	86.2
13	12.2	04.4	73	68.6	25.0	133	125.0	45.5	193	181.4	66.0	253	237.7	86.5
14	13.2	04.8	74	69.5	25.3	134	125.9	45.8	194	182.3	66.4	254	238.7	86.9
15	14.1	05.1	75	70.5	25.7	135	126.9	46.2	195	183.2	66.7	255	239.6	87.2
16	15.0	05.5	76	71.4	26.0	136	127.8	46.5	196	184.2	67.0	256	240.6	87.6
17	16.0	05.8	77	72.4	26.3	137	128.7	46.9	197	185.1	67.4	257	241.5	87.9
18	16.9	06.2	78	73.3	26.7	138	129.7	47.2	198	186.1	67.7	258	242.4	88.2
19	17.9	06.5	79	74.2	27.0	139	130.6	47.5	199	187.0	68.1	259	243.4	88.6
20	18.8	06.8	80	75.2	27.4	140	131.6	47.9	200	187.9	68.4	260	244.3	88.9
21	19.7	07.2	81	76.1	27.7	141	132.5	48.2	201	188.9	68.7	261	245.3	89.3
22	20.7	07.5	82	77.1	28.0	142	133.4	48.6	202	189.8	69.1	262	246.2	89.6
23	21.6	07.9	83	78.0	28.4	143	134.4	48.9	203	190.8	69.4	263	247.1	90.0
24	22.6	08.2	84	78.9	28.7	144	135.3	49.3	204	191.7	69.8	264	248.1	90.3
25	23.5	08.6	85	79.9	29.1	145	136.3	49.6	205	192.6	70.1	265	249.0	90.6
26	24.4	08.9	86	80.8	29.4	146	137.2	49.9	206	193.6	70.5	266	250.0	91.0
27	25.4	09.2	87	81.8	29.8	147	138.1	50.3	207	194.5	70.8	267	250.9	91.3
28	26.3	09.6	88	82.7	30.1	148	139.1	50.6	208	195.5	71.1	268	251.8	91.7
29	27.3	09.9	89	83.6	30.4	149	140.0	51.0	209	196.4	71.5	269	252.8	92.0
30	28.2	10.3	90	84.6	30.8	150	141.0	51.3	210	197.3	71.8	270	253.7	92.3
31	29.1	10.6	91	85.5	31.1	151	141.9	51.6	211	198.3	72.2	271	254.7	92.7
32	30.1	10.9	92	86.5	31.5	152	142.8	52.0	212	199.2	72.5	272	255.6	93.0
33	31.0	11.3	93	87.4	31.8	153	143.8	52.3	213	200.2	72.9	273	256.5	93.4
34	31.9	11.6	94	88.3	32.1	154	144.7	52.7	214	201.1	73.2	274	257.5	93.7
35	32.9	12.0	95	89.3	32.5	155	145.7	53.0	215	202.0	73.5	275	258.4	94.1
36	33.8	12.3	96	90.2	32.8	156	146.6	53.4	216	203.0	73.9	276	259.4	94.4
37	34.8	12.7	97	91.2	33.2	157	147.5	53.7	217	203.9	74.2	277	260.3	94.7
38	35.7	13.0	98	92.1	33.5	158	148.5	54.0	218	204.9	74.6	278	261.2	95.1
39	36.6	13.3	99	93.0	33.9	159	149.4	54.4	219	205.8	74.9	279	262.2	95.4
40	37.6	13.7	100	94.0	34.2	160	150.4	54.7	220	206.7	75.2	280	263.1	95.8
41	38.5	14.0	101	94.9	34.5	161	151.3	55.1	221	207.7	75.6	281	264.1	96.1
42	39.5	14.4	102	95.8	34.9	162	152.2	55.4	222	208.6	75.9	282	265.0	96.4
43	40.4	14.7	103	96.8	35.2	163	153.2	55.7	223	209.6	76.3	283	265.9	96.8
44	41.3	15.0	104	97.7	35.6	164	154.1	56.1	224	210.5	76.6	284	266.9	97.1
45	42.3	15.4	105	98.7	35.9	165	155.0	56.4	225	211.4	77.0	285	267.8	97.5
46	43.2	15.7	106	99.6	36.3	166	156.0	56.8	226	212.4	77.3	286	268.8	97.8
47	44.2	16 1	107	100.5	36.6	167	156.9	57.1	227	213.3	77.6	287	269.7	98.2
48	45.1	16.4	108	101.5	36.9	168	157.9	57.5	228	214.2	78.0	288	270.6	98.5
49	46.0	16.8	109	102.4	37.3	169	158.8	57.8	229	215.2	78.3	289	271.6	98.8
50	47.0	17.1	110	103.4	37.6	170	159.7	58.1	230	216.1	78.7	290	272.5	99.2
51	47.9	17.4	111	104.3	38.0	171	160.7	58.5	231	217.1	79.0	291	273.5	99.5
52	48.9	17.8	112	105.2	38.3	172	161.6	58.8	232	218.0	79.3	292	274.4	99.9
53	49.8	18.1	113	106.2	38.6	173	162.6	59.2	233	218.9	79.7	293	275.3	100.2
54	50.7	18.5	114	107.1	39.0	174	163.5	59.5	234	219.9	80.0	294	276.3	100 6
55	51.7	18.8	115	108.1	39.3	175	164.4	59.9	235	220.8	80.4	295	277.2	100.9
56	52.6	19.2	116	109.0	39.7	176	165.4	60.2	236	221.8	80.7	296	278.1	101.2
57	53.6	19.5	117	109.9	40.0	177	166.3	60.5	237	222.7	81.1	297	279.1	101.6
58	54.5	19.8	118	110.9	40.4	178	167.3	60.9	238	223.6	81.4	298	280.0	101.9
59	55.4	20.2	119	111.8	40.7	179	168.2	61.2	239	224.6	81 ?	299	281.0	102.3
60	56.4	20.5	120	112.8	41.0	180	169.1	61.6	240	225.5	82.1	30?	281.9	102.6
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 70 Degrees.

Difference of Latitude and Departure for 21 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	56.9	21.9	121	113.0	43.4	181	169.0	64 9	241	225.0	86.4
2	01.9	00.7	62	57.9	22.2	122	113.9	43.7	182	169.9	65.2	242	225.9	86.7
3	02.8	01.1	63	58.8	22.6	123	114.8	44.1	183	170.8	65.6	243	226.9	87.1
4	03.7	01.4	64	59.7	22.9	124	115.8	44.4	184	171.8	65.9	244	227.8	87.4
5	04.7	01.8	65	60.7	23.3	125	116.7	44.8	185	172.7	66.3	245	228.7	87.8
6	05.6	02.2	66	61.6	23.7	126	117.6	45.2	186	173.6	66.7	246	229.7	88.2
7	06.5	02.5	67	62.5	24.0	127	118.6	45.5	187	174.6	67.0	247	230.6	88.5
8	07.5	02.9	68	63.5	24.4	128	119.5	45.9	188	175.5	67.4	248	231.5	88.9
9	08.4	03.2	69	64.4	24.7	129	120.4	46.2	189	176.4	67.7	249	232.5	89.2
10	09.3	03.6	70	65.4	25.1	130	121.4	46.6	190	177.4	68.1	250	233.4	89.6
11	10.3	03.9	71	66.3	25.4	131	122.3	46.9	191	178.3	68.4	251	234.3	90.0
12	11.2	04.3	72	67.2	25.8	132	123.2	47.3	192	179.2	68.8	252	235.3	90.3
13	12.1	04.7	73	68.2	26.2	133	124.2	47.7	193	180.2	69.2	253	236.2	90.7
14	13.1	05.0	74	69.1	26.5	134	125.1	48.0	194	181.1	69.5	254	237.1	91.0
15	14.0	05.4	75	70.0	26.9	135	126.0	48.4	195	182.0	69.9	255	238.1	91.4
16	14.9	05.7	76	71.0	27.2	136	127.0	48.7	196	183.0	70.2	256	239.0	91.7
17	15.9	06.1	77	71.9	27.6	137	127.9	49.1	197	183.9	70.6	257	239.9	92.1
18	16.8	06.5	78	72.8	28.0	138	128.8	49.5	198	184.8	71.0	258	240.9	92.5
19	17.7	06.8	79	73.8	28.3	139	129.8	49.8	199	185.8	71.3	259	241.8	92.8
20	18.7	07.2	80	74.7	28.7	140	130.7	50.2	200	186.7	71.7	260	242.7	93.2
21	19.6	07.5	81	75.6	29.0	141	131.6	50.5	201	187.6	72.0	261	243.7	93.5
22	20.5	07.9	82	76.6	29.4	142	132.6	50.9	202	188.6	72.4	262	244.6	93.9
23	21.5	08.2	83	77.5	29.7	143	133.5	51.2	203	189.5	72.7	263	245.5	94.3
24	22.4	08.6	84	78.4	30.1	144	134.4	51.6	204	190.4	73.1	264	246.5	94.6
25	23.3	09.0	85	79.4	30.5	145	135.4	52.0	205	191.4	73.5	265	247.4	95.0
26	24.3	09.3	86	80.3	30.8	146	136.3	52.3	206	192.3	73.8	266	248.3	95.3
27	25.2	09.7	87	81.2	31.2	147	137.2	52.7	207	193.3	74.2	267	249.3	95.7
28	26.1	10.0	88	82.2	31.5	148	138.2	53.0	208	194.2	74.5	268	250.2	96.0
29	27.1	10.4	89	83.1	31.9	149	139.1	53.4	209	195.1	74.9	269	251.1	96.4
30	28.0	10.8	90	84.0	32.3	150	140.0	53.8	210	196.1	75.3	270	252.1	96.8
31	28.9	11.1	91	85.0	32.6	151	141.0	54.1	211	197.0	75.6	271	253.0	97.1
32	29.9	11.5	92	85.9	33.0	152	141.9	54.5	212	197.9	76.0	272	253.9	97.5
33	30.8	11.8	93	86.8	33.3	153	142.8	54.8	213	198.9	76.3	273	254.9	97.8
34	31.7	12.2	94	87.8	33.7	154	143.8	55.2	214	199.8	76.7	274	255.8	98.2
35	32.7	12.5	95	88.7	34.0	155	144.7	55.5	215	200.7	77.0	275	256.7	98.6
36	33.6	12.9	96	89.6	34.4	156	145.6	55.9	216	201.7	77.4	276	257.7	98.9
37	34.5	13.3	97	90.6	34.8	157	146.6	56.3	217	202.6	77.8	277	258.6	99.3
38	35.5	13.6	98	91.5	35.1	158	147.5	56.6	218	203.5	78.1	278	259.5	99.6
39	36.4	14.0	99	92.4	35.5	159	148.4	57.0	219	204.5	78.5	279	260.5	100.0
40	37.3	14.3	100	93.4	35.8	160	149.4	57.3	220	205.4	78.8	280	261.4	100.3
41	38.3	14.7	101	94.3	36.2	161	150.3	57.7	221	206.3	79.2	281	262.3	100.7
42	39.2	15.1	102	95.2	36.6	162	151.2	58.1	222	207.3	79.6	282	263.3	101.1
43	40.1	15.4	103	96.2	36.9	163	152.2	58.4	223	208.2	79.9	283	264.2	101.4
44	41.1	15.8	104	97.1	37.3	164	153.1	58.8	224	209.1	80.3	284	265.1	101.8
45	42.0	16.1	105	98.0	37.6	165	154.0	59.1	225	210.1	80.6	285	266.1	102.1
46	42.9	16.5	106	99.0	38.0	166	155.0	59.5	226	211.0	81.0	286	267.0	102.5
47	43.9	16.8	107	99.9	38.3	167	155.9	59.8	227	211.9	81.3	287	267.9	102.9
48	44.8	17.2	108	100.8	38.7	168	156.8	60.2	228	212.9	81.7	288	268.9	103.2
49	45.7	17.6	109	101.8	39.1	169	157.8	60.6	229	213.8	82.1	289	269.8	103.6
50	46.7	17.9	110	102.7	39.4	170	158.7	60.9	230	214.7	82.4	290	270.7	103.9
51	47.6	18.3	111	103.6	39.8	171	159.6	61.3	231	215.7	82.8	291	271.7	104.3
52	48.5	18.6	112	104.6	40.1	172	160.6	61.6	232	216.6	83.1	292	272.6	104.6
53	49.5	19.0	113	105.5	40.5	173	161.5	62.0	233	217.5	83.5	293	273.5	105.0
54	50.4	19.4	114	106.4	40.9	174	162.4	62.4	234	218.5	83.9	294	274.5	105.4
55	51.3	19.7	115	107.4	41.2	175	163.4	62.7	235	219.4	84.2	295	275.4	105.7
56	52.3	20.1	116	108.3	41.6	176	164.3	63.1	236	220.3	84.6	296	276.3	106.1
57	53.2	20.4	117	109.2	41.9	177	165.2	63.4	237	221.3	84.9	297	277.3	106.4
58	54.1	20.8	118	110.2	42.3	178	166.2	63.8	238	222.2	85.3	298	278.2	106.8
59	55.1	21.1	119	111.1	42.6	179	167.1	64.1	239	223.1	85.6	299	279.1	107.2
60	56.0	21.5	120	112.0	43.0	180	168.0	64.5	240	224.1	86.0	300	280.1	107.5
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 22 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	56 6	22.9	121	112.2	45.3	181	167.8	67.8	241	223.5	90.3
2	01.9	00.7	62	57.5	23.2	122	113.1	45.7	182	168.7	68.2	242	224.4	90.7
3	02.8	01.1	63	58.4	23.6	123	114.0	46.1	183	169.7	68.6	243	225.3	91.0
4	03.7	01.5	64	59.3	24.0	124	115 0	46.5	184	170.6	68.9	244	226.2	91.4
5	04.6	01.9	65	60.3	24.3	125	115.9	46.8	185	171.5	69.3	245	227.2	91.8
6	05.6	02.2	66	61.2	24.7	126	116.8	47.2	186	172.5	69.7	246	228.1	92.2
7	06.5	02.6	67	62.1	25.1	127	117.8	47.6	187	173.4	70.1	247	229.0	02.5
8	07.4	03.0	68	63.0	25.5	128	118.7	47.9	188	174.3	70.4	248	229.9	92.9
9	08.3	03.4	69	64.0	25.8	129	119.6	48.3	189	175.2	70.8	249	230.9	93.3
10	09.3	03.7	70	64.9	26.2	130	120.5	48.7	190	176.2	71.2	250	231.8	93.7
11	10.2	04.1	71	65.8	26.6	131	121.5	49.1	191	177.1	71.5	251	232.7	94.0
12	11.1	04.5	72	66.8	27.0	132	122.4	49.4	192	178.0	71.9	252	233.7	94.4
13	12.1	04.9	73	67.7	27.3	133	123.3	49.8	193	178.9	72.3	253	234.6	94.8
14	13.0	05.2	74	68.6	27.7	134	124.2	50.2	194	179.9	72.7	254	235.5	95.2
15	13.9	05.6	75	69.5	28.1	135	125.2	50.6	195	180.8	73.0	255	236.4	95.5
16	14.8	06.0	76	70.5	28.5	136	126.1	50.9	196	181.7	73.4	256	237.4	95.9
17	15.8	06.4	77	71.4	28.8	137	127.0	51.3	197	182.7	73.8	257	238.3	96.3
18	16.7	06.7	78	72.3	29.2	138	128.0	51.7	198	183.6	74.2	258	239.2	96.6
19	17.6	07.1	79	73.2	29.6	139	128.9	52.1	199	184.5	74.5	259	240.1	97.0
20	18.5	07.5	80	74.2	30.0	140	129.8	52.4	200	185.4	74.9	260	241.1	97.4
21	19.5	07.9	81	75.1	30.3	141	130.7	52.8	201	186.4	75.3	261	242.0	97.8
22	20.4	08.2	82	76.0	30.7	142	131.7	53.2	202	187.3	75.7	262	242.9	98.1
23	21.3	08.6	83	77.0	31.1	143	132.6	53.6	203	188.2	76.0	263	243.8	98 5
24	22.3	09.0	84	77.9	31.5	144	133.5	53.9	204	189.1	76.4	264	244.8	98.9
25	23.2	09.4	85	78.8	31.8	145	134.4	54.3	205	190.1	76.8	265	245.7	99.3
26	24.1	09.7	86	79.7	32.2	146	135.4	54.7	206	191.0	77.2	266	246.6	99.6
27	25.0	10.1	87	80.7	32.6	147	136.3	55.1	207	191.9	77.5	267	247.6	100.0
28	26.0	10.5	88	81.6	33.0	148	137.2	55.4	208	192.9	77.9	268	248.5	100.4
29	26.9	10.9	89	82.5	33.3	149	138.2	55.8	209	193.8	78.3	269	249.4	100.8
30	27.8	11.2	90	83.4	33.7	150	139.1	56.2	210	194.7	78.7	270	250.3	101.1
31	28.7	11.6	91	84.4	34.1	151	140.0	56.6	211	195.6	79.0	271	251.3	101.5
32	29.7	12.0	92	85.3	34.5	152	140.9	56.9	212	196.6	79.4	272	252.2	101.9
33	30.6	12.4	93	86.2	34.8	153	141.9	57.3	213	197.5	79.8	273	253.1	102.3
34	31.5	12.7	94	87.2	35.2	154	142.8	57.7	214	198.4	80.2	274	254.0	102.6
35	32.5	13.1	95	88.1	35.6	155	143.7	58.1	215	199.3	80.5	275	255.0	103.0
36	33.4	13.5	96	89.0	36.0	156	144.6	58.4	216	200.3	80.9	276	255.9	103.4
37	34.3	13.9	97	89.9	36.3	157	145.6	58.8	217	201.2	81.3	277	256.8	103.8
38	35.2	14.2	98	90.9	36.7	158	146.5	59.2	218	202.1	81.7	278	257.8	104.1
39	36.2	14.6	99	91.8	37.1	159	147.4	59.6	219	203.1	82.0	279	258.7	104.5
40	37.1	15.0	100	92.7	37.5	160	148.3	59.9	220	204.0	82.4	280	259.6	104.9
41	38.0	15.4	101	93.6	37.8	161	149.3	60.3	221	204.9	82.8	281	260.5	105.3
42	38.9	15.7	102	94.6	38.2	162	150.2	60.7	222	205.8	83.2	282	261.5	105.6
43	39.9	16.1	103	95.5	38.6	163	151.1	61.1	223	206.8	83.5	283	262.4	106.0
44	40.8	16.5	104	96.4	39.0	164	152.1	61.4	224	207.7	83.9	284	263.3	106.4
45	41.7	16.9	105	97.4	39.3	165	153.0	61.8	225	208.6	84.3	285	264.2	106.8
46	42.7	17.2	106	98.3	39.7	166	153.9	62.2	226	209.5	84.7	286	265.2	107.1
47	43.6	17.6	107	99.2	40.1	167	154.8	62.6	227	210.5	85.0	287	266.1	107.5
48	44.5	18.0	108	100.1	40.5	168	155.8	62.9	228	211.4	85.4	288	267.0	107.9
49	45.4	18.4	109	101.1	40.8	169	156.7	63.3	229	212.3	85.8	289	268.0	108.3
50	46.4	18.7	110	102.0	41.2	170	157.6	63.7	230	213.3	86.2	290	268.9	108.6
51	47.3	19.1	111	102.9	41.6	171	158.5	64.1	231	214.2	86.5	291	269.8	109.0
52	48.2	19.5	112	103.8	42.0	172	159.5	64.4	232	215.1	86.9	292	270.7	109.4
53	49.1	19.9	113	104.8	42.3	173	160.4	04.8	233	216.0	87.3	293	271.7	109.8
54	50.1	20.2	114	105.7	42.7	174	161.3	65.2	234	217.0	87.7	294	272.6	110.1
55	51.0	20.6	115	106.6	43.1	175	162.3	65.6	235	217.9	88.0	295	273.5	110.5
56	51.9	21.0	116	107.6	43.5	176	163.2	65.9	236	218.8	88.4	296	274.4	110.9
57	52 8	21.4	117	108.5	43.8	177	164.1	66.3	237	219.7	88.8	297	275.4	111.3
58	53.8	21.7	118	109.4	44.2	178	165.0	66.7	238	220.7	89.2	298	276.3	111.6
59	54.7	22.1	119	110.3	44.6	179	166.0	67.1	239	221.6	89.5	299	277.2	112.0
60	55.6	22.5	120	111.3	45.0	180	166.9	67.4	240	222.5	89.9	300	278.2	112.4
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 23 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	56.2	23.8	121	111.4	47.3	181	166.6	70.7	241	221.8	94.2
2	01.8	00.8	62	57.1	24.2	122	112.3	47.7	182	167.5	71.1	242	222.8	94.6
3	02.8	01.2	63	58.0	24.6	123	113.2	48.1	183	168.5	71.5	243	223.7	94.9
4	03.7	01.6	64	58.9	25.0	124	114.1	48.5	184	169.4	71.9	244	224.6	95.3
5	04.6	02.0	65	59.8	25.4	125	115.1	48.8	185	170.3	72.3	245	225.5	95.7
6	05.5	02.3	66	60.8	25.8	126	116.0	49.2	186	171.2	72.7	246	226.4	96.1
7	06.4	02.7	67	61.7	26.2	127	116.9	49.6	187	172.1	73.1	247	227.4	96.5
8	07.4	03.1	68	62.6	26.6	128	117.8	50 0	188	173.1	73.5	248	228.3	96.9
9	08.3	03.5	69	63.5	27.0	129	118.7	50.4	189	174.0	73.8	249	229.2	97.3
10	09.2	03.9	70	64.4	27.4	130	119.7	50.8	190	174.9	74.2	250	230.1	97.7
11	10.1	04.3	71	65.4	27.7	131	120.6	51.2	191	175.8	74.6	251	231.0	98.1
12	11.0	04.7	72	66.3	28.1	132	121.5	51.6	192	176.7	75.0	252	232.0	98.5
13	12.0	05.1	73	67.2	28.5	133	122.4	52.0	193	177.7	75.4	253	232.9	98.9
14	12.9	05.5	74	68.1	28.9	134	123.3	52.4	194	178.6	75.8	254	233.8	99.2
15	13.8	05.9	75	69.0	29.3	135	124.3	52.7	195	179.5	76.2	255	234.7	99.6
16	14.7	06.3	76	70.0	29.7	136	125.2	53.1	196	180.4	76.6	256	235 6	100.0
17	15.6	06.6	77	70.9	30.1	137	126.1	53.5	197	181.3	77.0	257	236.6	100.4
18	16.6	07.0	78	71.8	30.5	138	127.0	53.9	198	182.3	77.4	258	237.5	100.8
19	17.5	07.4	79	72.7	30.9	139	128.0	54.3	199	183.2	77.8	259	238.4	101.2
20	18.4	07.8	80	73.6	31.3	140	128.9	54.7	200	184.1	78.1	260	239.3	101.6
21	19.3	08.2	81	74.6	31.6	141	129.8	55.1	201	185.0	78.5	261	240.3	102.0
22	20.3	08.6	82	75.5	32.0	142	130.7	55.5	202	185.9	78.9	262	241.2	102.4
23	21.2	09.0	83	76.4	32.4	143	131.6	55.9	203	186.9	79.3	263	242.1	102.8
24	22.1	09.4	84	77.3	32.8	144	132.6	56.3	204	187.8	79.7	264	243.0	103 2
25	23.0	09.8	85	78.2	33.2	145	133.5	56.7	205	188.7	80.1	265	243.9	103.5
26	23.9	10.2	86	79.2	33.6	146	134.4	57.0	206	189.6	80.5	266	244.9	103.9
27	24.9	10.5	87	80.1	34.0	147	135.3	57.4	207	190.5	80.9	267	245.8	104.3
28	25.8	10.9	88	81.0	34.4	148	136.2	57.8	208	191.5	81.3	268	246.7	104.7
29	26.7	11.3	89	81.9	34.8	149	137.2	58.2	209	192.4	81.7	269	247.6	105.1
30	27.6	11.7	90	82.8	35.2	150	138.1	58.6	210	193.3	82.1	270	248.5	105.5
31	28.5	12.1	91	83.8	35.6	151	139.0	59.0	211	194.2	82.4	271	249.5	105.9
32	29.5	12 5	92	84.7	35.9	152	139.9	59.4	212	195.1	82.8	272	250.4	106.3
33	30.4	12.9	93	85.6	36.3	153	140.8	59.8	213	196.1	83.2	273	251.3	106.7
34	31.3	13.3	94	86.5	36.7	154	141.8	60.2	214	197.0	83.6	274	252.2	107.1
35	32.2	13.7	95	87.4	37.1	155	142.7	60.6	215	197.9	84.0	275	253.1	107.5
36	33.1	14.1	96	88.4	37.5	156	143.6	61.0	216	198.8	84.4	276	254.1	107.8
37	34.1	14.5	97	89.3	37.9	157	144.5	61.3	217	199.7	84.8	277	255.0	108.2
38	35.0	14.8	98	90.2	38.3	158	145.4	61.7	218	200.7	85.2	278	255.9	108.6
39	35.9	15.2	99	91.1	38.7	159	146.4	62.1	219	201.6	85.6	279	256.8	109.0
40	36.8	15.6	100	92.1	39.1	160	147.3	62.5	220	202.5	86.0	280	257.7	109.4
41	37.7	16.0	101	93.0	39.5	161	148.2	62.9	221	203.4	86.4	281	258.7	109.8
42	38.7	16.4	102	93.9	39.9	162	149.1	63.3	222	204.4	86.7	282	259.6	110.2
43	39.6	16.8	103	94.8	40.2	163	150.0	63.7	223	205.3	87.1	283	260.5	110.6
44	40.5	17.2	104	95.7	40.6	164	151.0	64.1	224	206.2	87.5	284	261.4	111.0
45	41.4	17.6	105	96.7	41.0	165	151.9	64.5	225	207.1	87.9	285	262.3	111.4
46	42.3	18.0	106	97.6	41.4	166	152.8	64.9	226	208.0	88.3	286	263.3	111.7
47	43.3	18.4	107	98.5	41.8	167	153.7	65.3	227	209.0	88.7	287	264.2	112.1
48	44.2	18.8	108	99.4	42.2	168	154.6	65.6	228	209.9	89.1	288	265.1	112.5
49	45.1	19.1	109	100.3	42.6	169	155.6	66.0	229	210.8	89.5	289	266.0	112.9
50	46.0	19.5	110	101.3	43.0	170	156.5	66.4	230	211.7	89.9	290	266.9	113.3
51	46.9	19.9	111	102.2	43.4	171	157.4	66.8	231	212.6	90.3	291	267.9	113.7
52	47.9	20.3	112	103.1	43.8	172	158.3	67.2	232	213.6	90.6	292	268.8	114.1
53	48.8	20.7	113	104.0	44.2	173	159.2	67.6	233	214.5	91.0	293	269.7	114.5
54	49.7	21.1	114	104.9	44.5	174	160.2	68.0	234	215.4	91.4	294	270.6	114.9
55	50.6	21.5	115	105.9	44.9	175	161.1	68.4	235	216.3	91.8	295	271.5	115.3
56	51.5	21.9	116	106.8	45.3	176	162.0	68.8	236	217.2	92.2	296	272.5	115.7
57	52.5	22.3	117	107.7	45.7	177	162.9	69.2	237	218.2	92.6	297	273.4	116.0
58	53.4	22.7	118	108.6	46.1	178	163.8	69.6	238	219.1	93.0	298	274.3	116.4
59	54.3	23.1	119	109.5	46.5	179	164.8	69.9	239	220.0	93.4	299	275.2	116.8
60	55.2	23.4	120	110.5	46.9	180	165.7	70.3	240	220.9	93.8	300	276.2	117.2
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 67 Degrees.

TABLE II.

Difference of Latitude and Departure for 24 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	55.7	24.8	121	110.5	49.2	181	165.4	73.6	241	220.2	98.0
2	01.8	00.8	62	56.6	25.2	122	111.5	49.6	182	166.3	74.0	242	221.1	98.4
3	02.7	01.2	63	57.6	25.6	123	112.4	50.0	183	167.2	74.4	243	222.0	98.8
4	03.7	01.6	64	58.5	26.0	124	113.3	50.4	184	168.1	74.8	244	222.9	99.2
5	04.6	02.0	65	59.4	26.4	125	114.2	50.8	185	169.0	75.2	245	223.8	99.7
6	05.5	02.4	66	60.3	26.8	126	115.1	51.2	186	169.9	75.7	246	224.7	100.1
7	06.4	02.8	67	61.2	27.3	127	116.0	51.7	187	170.8	76.1	247	225.6	100.5
8	07.3	03.3	68	62.1	27.7	128	116.9	52.1	188	171.7	76.5	248	226.6	100.9
9	08.2	03.7	69	63.0	28.1	129	117.8	52.5	189	172.7	76.9	249	227 5	101.3
10	09.1	04.1	70	63.9	28.5	130	118.8	52.9	190	173.6	77.3	250	228..	101.7
11	10.0	04.5	71	64.9	28.9	131	119.7	53.3	191	174.5	77.7	251	229.3	102.1
12	11.0	04.9	72	65.8	29.3	132	120.6	53.7	192	175.4	78.1	252	230.2	102.5
13	11.9	05.3	73	66.7	29.7	133	121.5	54.1	193	176.3	78.5	253	231.1	102.9
14	12.8	05.7	74	67.6	30.1	134	122.4	54.5	194	177.2	78.9	254	232.0	103.3
15	13.7	06.1	75	68.5	30.5	135	123.3	54.9	195	178.1	79.3	255	233.0	103.7
16	14.6	06.5	76	69.4	30.9	136	124.2	55.3	196	179.1	79.7	256	233.9	104 1
17	15.5	06.9	77	70.3	31.3	137	125.2	55.7	197	180.0	80.1	257	234.8	104.5
18	16.4	07.3	78	71.3	31.7	138	126.1	56.1	198	180.9	80.5	258	235.7	104.9
19	17.4	07.7	79	72.2	32.1	139	127.0	56.5	199	181.8	80.9	259	236.6	105.3
20	18.3	08.1	80	73.1	32.5	140	127.9	56.9	200	182.7	81.3	260	237.5	105.8
21	19.2	08.5	81	74.0	32.9	141	128.8	57.3	201	183.6	81.8	261	238.4	106.2
22	20.1	08.9	82	74.9	33.4	142	129.7	57.8	202	184.5	82.2	262	239.3	106.6
23	21.0	09.4	83	75.8	33.8	143	130.6	58.2	203	185.4	82.6	263	240.3	107.0
24	21.9	09.8	84	76.7	34.2	144	131.6	58.6	204	186.4	83.0	264	241.2	107.4
25	22.8	10.2	85	77.7	34.6	145	132.5	59.0	205	187.3	83.4	265	242.1	107.8
26	23.8	10.6	86	78.6	35.0	146	133.4	59.4	206	188.2	83.8	266	243.0	108.2
27	24.7	11.0	87	79.5	35.4	147	134.3	59.8	207	189.1	84.2	267	243.9	108.6
28	25.6	11.4	88	80.4	35.8	148	135.2	60.2	208	190.0	84.6	268	244.8	109.0
29	26.5	11.8	89	81.3	36.2	149	136.1	60.6	209	190.9	85.0	269	245.7	109.4
30	27.4	12.2	90	82.2	36.6	150	137.0	61.0	210	191.8	85.4	270	246.7	109 8
31	28.3	12.6	91	83.1	37.0	151	137.9	61.4	211	192.8	85.8	271	247.6	110 2
32	29.2	13.0	92	84.0	37.4	152	138.9	61.8	212	193.7	86.2	272	248.5	110 6
33	30.1	13.4	93	85.0	37.8	153	139.8	62.2	213	194.6	86.6	273	249.4	111.0
34	31.1	13.8	94	85.9	38.2	154	140.7	62.6	214	195.5	87.0	274	250.3	111.4
35	32.0	14.2	95	86.8	38.6	155	141.6	63.0	215	196.4	87.4	275	251.2	111.9
36	32.9	14.6	96	87.7	39.0	156	142.5	63.5	216	197.3	87.9	276	252.1	112.3
37	33.8	15.0	97	88.6	39.5	157	143.4	63.9	217	198.2	88.3	277	253.1	112.7
38	34.7	15.5	98	89.5	39.9	158	144.3	64.3	218	199.2	88.7	278	254.0	113.1
39	35.6	15.9	99	90.4	40.3	159	145.3	64.7	219	200.1	89.1	279	254.9	113.5
40	36.5	16.3	100	91.4	40.7	160	146.2	65.1	220	201.0	89.5	280	255.8	113.9
41	37.5	16.7	101	92.3	41.1	161	147.1	65.5	221	201.9	89.9	281	256.7	114.3
42	38.4	17.1	102	93.2	41.5	162	148.0	65.9	222	202.8	90.3	282	257.6	114.7
43	39.3	17.5	103	94.1	41.9	163	148.9	66.3	223	203.7	90.7	283	258.5	115.1
44	40.2	17.9	104	95.0	42.3	164	149.8	66.7	224	204.6	91.1	284	259.4	115.5
45	41.1	18.3	105	95.9	42.7	165	150.7	67.1	225	205.5	91.5	285	260.4	115.9
46	42.0	18.7	106	96.8	43.1	166	151.6	67.5	226	206.5	91.9	286	261.3	116.3
47	42.9	19.1	107	97.7	43.5	167	152.6	67.9	227	207.4	92.3	287	262.2	116.7
48	43.9	19.5	108	98.7	43.9	168	153.5	68.3	228	208.3	92.7	288	263.1	117.1
49	44.8	19.9	109	99.6	44.3	169	154.4	68.7	229	209.2	93.1	289	264.0	117.5
50	45.7	20.3	110	100.5	44.7	170	155.3	69.1	230	210.1	93.5	290	264.9	118.0
51	46.6	20.7	111	101.4	45.1	171	156.2	69.6	231	211.0	94.0	291	265.8	118.4
52	47.5	21.2	112	102.3	45.6	172	157.1	70.0	232	211.9	94.4	292	266.8	118.8
53	48.4	21.6	113	103.2	46.0	173	158.0	70.4	233	212.9	94.8	293	267.7	119.2
54	49.3	22.0	114	104.1	46.4	174	159.0	70.8	234	213.8	95.2	294	268.6	119.6
55	50.2	22.4	115	105.1	46.8	175	159.9	71.2	235	214.7	95.6	295	269.5	120.0
56	51.2	22.8	116	106.0	47.2	176	160.8	71.6	236	215.6	96.0	296	270.4	120.4
57	52.1	23.2	117	106.9	47.6	177	161.7	72.0	237	216.5	96.4	297	271.3	120.8
58	53.0	23.6	118	107.8	48.0	178	162.6	72.4	238	217.4	96.8	298	272.2	121.2
59	53.9	24.0	119	108.7	48.4	179	163.5	72.8	239	218.3	97.2	299	273.2	121.6
60	54.8	24.4	120	109.6	48.8	180	164.4	73.2	240	219.3	97.6	300	274.1	122.0
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 66 Degrees.

Difference of Latitude and Departure for 25 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	55.3	25.8	121	109.7	51.1	181	164.0	76.5	241	218.4	101.9
2	01.8	00.8	62	56.2	26.2	122	110.6	51.6	182	164.9	76.9	242	219.3	102.3
3	02.7	01.3	63	57.1	26.6	123	111.5	52.0	183	165.9	77.3	243	220.2	102.7
4	03.6	01.7	64	58.0	27.0	124	112.4	52.4	184	166.8	77.8	244	221.1	103.1
5	04.5	02.1	65	58.9	27.5	125	113.3	52.8	185	167.7	78.2	245	222.0	103.5
6	05.4	02.5	66	59.8	27.9	126	114.2	53.2	186	168.6	78.6	246	223.0	104.0
7	06.3	03.0	67	60.7	28.3	127	115.1	53.7	187	169.5	79.0	247	223.9	104.4
8	07.3	03.4	68	61.6	28.7	128	116.0	54.1	188	170.4	79.5	248	224.8	104.8
9	08.2	03.8	69	62.5	29.2	129	116.9	54.5	189	171.3	79.9	249	225.7	105.2
10	09.1	04.2	70	63.4	29.6	130	117.8	54.9	190	172.2	80.3	250	226.6	105.7
11	10.0	04.6	71	64.3	30.0	131	118.7	55.4	191	173.1	80.7	251	227.5	106.1
12	10.9	05.1	72	65.3	30.4	132	119.6	55.8	192	174.0	81.1	252	228.4	106.5
13	11.8	05.5	73	66.2	30.9	133	120.5	56.2	193	174.9	81.6	253	229.3	106.9
14	12.7	05.9	74	67.1	31.3	134	121.4	56.6	194	175.8	82.0	254	230.2	107.3
15	13.6	06.3	75	68.0	31.7	135	122.4	57.1	195	176.7	82.4	255	231.1	107.8
16	14.5	06.8	76	68.9	32.1	136	123.3	57.5	196	177.6	82.8	256	232.0	108.2
17	15.4	07.2	77	69.8	32.5	137	124.2	57.9	197	178.5	83.3	257	232.9	108.6
18	16.3	07.6	78	70.7	33.0	138	125.1	58.3	198	179.4	83.7	258	233.8	109.0
19	17.2	08.0	79	71.6	33.4	139	126.0	58.7	199	180.4	84.1	259	234.7	109.5
20	18.1	08.5	80	72.5	33.8	140	126.9	59.2	200	181.3	84.5	260	235.6	109.9
21	19.0	08.9	81	73.4	34.2	141	127.8	59.6	201	182.2	84.9	261	236.5	110.3
22	19.9	09.3	82	74.3	34.7	142	128.7	60.0	202	183.1	85.4	262	237.5	110.7
23	20.8	09.7	83	75.2	35.1	143	129.6	60.4	203	184.0	85.8	263	238.4	111.1
24	21.8	10.1	84	76.1	35.5	144	130.5	60.9	204	184.9	86.2	264	239.3	111.6
25	22.7	10.6	85	77.0	35.9	145	131.4	61.3	205	185.8	86.6	265	240.2	112.0
26	23.6	11.0	86	77.9	36.3	146	132.3	61.7	206	186.7	87.1	266	241.1	112.4
27	24.5	11.4	87	78.8	36.8	147	133.2	62.1	207	187.6	87.5	267	242.0	112.8
28	25.4	11.8	88	79.8	37.2	148	134.1	62.5	208	188.5	87.9	268	242.9	113.3
29	26.3	12.3	89	80.7	37.6	149	135.0	63.0	209	189.4	88.3	269	243.8	113.7
30	27.2	12.7	90	81.6	38.0	150	135.9	63.4	210	190.3	88.7	270	244.7	114.1
31	28.1	13.1	91	82.5	38.5	151	136.9	63.8	211	191.2	89.2	271	245.6	114.5
32	29.0	13.5	92	83.4	38.9	152	137.8	64.2	212	192.1	89.6	272	246.5	115.0
33	29.9	13.9	93	84.3	39.3	153	138.7	64.7	213	193.0	90.0	273	247.4	115.4
34	30.8	14.4	94	85.2	39.7	154	139.6	65.1	214	193.9	90.4	274	248.3	115.8
35	31.7	14.8	95	86.1	40.1	155	140.5	65.5	215	194.9	90.9	275	249.2	116.2
36	32.6	15.2	96	87.0	40.6	156	141.4	65.9	216	195.8	91.3	276	250.1	116.6
37	33.5	15.6	97	87.9	41.0	157	142.3	66.4	217	196.7	91.7	277	251.0	117.1
38	34.4	16.1	98	88.8	41.4	158	143.2	66.8	218	197.6	92.1	278	252.0	117.5
39	35.3	16.5	99	89.7	41.8	159	144.1	67.2	219	198.5	92.6	279	252.9	117.9
40	36.3	16.9	100	90.6	42.3	160	145.0	67.6	220	199.4	93.0	280	253.8	118.3
41	37.2	17.3	101	91.5	42.7	161	145.9	68.0	221	200.3	93.4	281	254.7	118.8
42	38.1	17.7	102	92.4	43.1	162	146.8	68.5	222	201.2	93.8	282	255.6	119.2
43	39.0	18.2	103	93.3	43.5	163	147.7	68.9	223	202.1	94.2	283	256.5	119.6
44	39.9	18.6	104	94.3	44.0	164	148.6	69.3	224	203.0	94.7	284	257.4	120.0
45	40.8	19.0	105	95.2	44.4	165	149.5	69.7	225	203.9	95.1	285	258.3	120.4
46	41.7	19.4	106	96.1	44.8	166	150.4	70.2	226	204.8	95.5	286	259.2	120.9
47	42.6	19.9	107	97.0	45.2	167	151.4	70.6	227	205.7	95.9	287	260.1	121.3
48	43.5	20.3	108	97.9	45.6	168	152.3	71.0	228	206.6	96.4	288	261.0	121.7
49	44.4	20.7	109	98.8	46.1	169	153.2	71.4	229	207.5	96.8	289	261.9	122.1
50	45.3	21.1	110	99.7	46.5	170	154.1	71.8	230	208.5	97.2	290	262.8	122.6
51	46.2	21.6	111	100.6	46.9	171	155 0	72.3	231	209.4	97.6	291	263.7	123.0
52	47.1	22.0	112	101.5	47.3	172	155.9	72.7	232	210.3	98.0	292	264.6	123.4
53	48.0	22.4	113	102.4	47.8	173	156.8	73.1	233	211.2	98.5	293	265.5	123.8
54	48.9	22.8	114	103.3	48.2	174	157.7	73.5	234	212.1	98.9	294	266.5	124.2
55	49.8	23.2	115	104.2	48.6	175	158.6	74.0	235	213.0	99.3	295	267.4	124.7
56	50.8	23.7	116	105.1	49.0	176	159.5	74.4	236	213.9	99.7	296	268.3	125.1
57	51.7	24.1	117	106.0	49.4	177	160.4	74.8	237	214.8	100.2	297	269.2	125.5
58	52.6	24.5	118	106.9	49.9	178	161.3	75.2	238	215.7	100.6	298	270.1	125.9
59	53.5	24.9	119	107.9	50.3	179	162.2	75.6	239	216.6	101.0	299	271.0	126.4
60	54.4	25.4	120	108.8	50.7	180	163.1	76.1	240	217.5	101.4	300	271.9	126.8
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 26 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	54.8	26.7	121	108.8	53.0	181	162.7	79.3	241	216.6	105.6
2	01.8	00.9	62	55.7	27.2	122	109.7	53.5	182	163.6	79.8	242	217.5	106.1
3	02.7	01.3	63	56.6	27.6	123	110.6	53.9	183	164.5	80 2	243	218.4	106.5
4	03.6	01 8	64	57.5	28.1	124	111.5	54.4	184	165.4	80.7	244	219.3	107.0
5	04.5	02.2	65	58.4	28.5	125	112.3	54.8	185	166.3	81.1	245	220.2	107.4
6	05.4	02.6	66	59.3	28.9	126	113.2	55.2	186	167.2	81.5	246	221.1	107.8
7	06.3	03.1	67	60.2	29.4	127	114.1	55.7	187	168.1	82.0	247	222.0	108.3
8	07.2	03.5	68	61.1	29.8	128	115.0	56.1	188	169.0	82.4	248	222.9	108.7
9	08.1	03 9	69	62.0	30.2	129	115.9	56.5	189	169.9	82.9	249	223.8	109.2
10	09.0	04.4	70	62.9	30.7	130	116.8	57.0	190	170.8	83.3	250	224.7	109.6
11	09.9	04.8	71	63.8	31.1	131	117.7	57.4	191	171.7	83.7	251	225.6	110.0
12	10.8	05.3	72	64.7	31.6	132	118.6	57.9	192	172.6	84.2	252	226.5	110.5
13	11.7	05.7	73	65.6	32.0	133	119.5	58.3	193	173.5	84.6	253	227.4	110.9
14	12.6	06.1	74	66.5	32.4	134	120.4	58.7	194	174.4	85.0	254	228.3	111.3
15	13.5	06.6	75	67.4	32.9	135	121.3	59.2	195	175.3	85.5	255	229.2	111.8
16	14.4	07.0	76	68.3	33.3	136	122.2	59.6	196	176.2	85.9	256	230.1	112.2
17	15.3	07.5	77	69.2	33.8	137	123.1	60.1	197	177.1	86.4	257	231.0	112.7
18	16.2	07.9	78	70.1	34.2	138	124.0	60.5	198	178.0	86.8	258	231.9	113.1
19	17.1	08.3	79	71.0	34.6	139	124.9	60.9	199	178.9	87.2	259	232.8	113.5
20	18.0	08.8	80	71.9	35.1	140	125.8	61 4	200	179.8	87.7	260	233.7	114.0
21	18.9	09.2	81	72.8	35.5	141	126.7	61.8	201	180.7	88.1	261	234.6	114.4
22	19.8	09.6	82	73.7	35.9	142	127.6	62.2	202	181.6	88.6	262	235.5	114.9
23	20.7	10.1	83	74.6	36.4	143	128.5	62.7	203	182.5	89.0	263	236.4	115.3
24	21.6	10.5	84	75.5	36.8	144	129.4	63.1	204	183.4	89.4	264	237.3	115.7
25	22.5	11.0	85	76.4	37.3	145	130.3	63.6	205	184.3	89.9	265	238.2	116.2
26	23.4	11.4	86	77.3	37.7	146	131.2	64.0	206	185.2	90.3	266	239.1	116.6
27	24.3	11.8	87	78.2	38.1	147	132.1	64.4	207	186.1	90.7	267	240.0	117.0
28	25.2	12.3	88	79.1	38.6	148	133.0	64.9	208	186.9	91.2	268	240.9	117.5
29	26.1	12.7	89	80.0	39.0	149	133.9	65.3	209	187.8	91.6	269	241.8	117.9
30	27.0	13.2	90	80.9	39.5	150	134.8	65.8	210	188.7	92.1	270	242.7	118.4
31	27.9	13.6	91	81.8	39.9	151	135.7	66.2	211	189.6	92.5	271	243.6	118.8
32	28.8	14.0	92	82.7	40.3	152	136.6	66.6	212	190.5	92.9	272	244.5	119.2
33	29.7	14.5	93	83.6	40.8	153	137.5	67.1	213	191.4	93.4	273	245.4	119.7
34	30.6	14.9	94	84.5	41.2	154	138.4	67.5	214	192.3	93.8	274	246.3	120.1
35	31.5	15.3	95	85.4	41.6	155	139.3	67.9	215	193.2	94.2	275	247.2	120.6
36	32.4	15.8	96	86.3	42.1	156	140.2	68.4	216	194.1	94.7	276	248.1	121.0
37	33.3	16.2	97	87.2	42.5	157	141.1	68.8	217	195.0	95.1	277	249.0	121.4
38	34.2	16.7	98	88.1	43.0	158	142.0	69.3	218	195.9	95.6	278	249.9	121.9
39	35.1	17.1	99	89.0	43.4	159	142.9	69.7	219	196.8	96.0	279	250.8	122.3
40	36 0	17.5	100	89.9	43.8	160	143.8	70.1	220	197.7	96.4	280	251.7	122.7
41	36.9	18.0	101	90.8	44.3	161	144.7	70.6	221	198.6	96.9	281	252.6	123.2
42	37.7	18.4	102	91.7	44.7	162	145.6	71.0	222	199.5	97.3	282	253.5	123 6
43	38.6	18.8	103	92.6	45.2	163	146.5	71.5	223	200.4	97.8	283	254.4	124.1
44	39.5	19.3	104	93.5	45.6	164	147.4	71.9	224	201.3	98.2	284	255.3	124.5
45	40.4	19.7	105	94.4	46.0	165	148.3	72.3	225	202.2	98.6	285	256.2	124.9
46	41.3	20.2	106	95.3	46.5	166	149.2	72.8	226	203.1	99.1	286	257.1	125.4
47	42.2	20.6	107	96.2	46.9	167	150.1	73.2	227	204.0	99.5	287	258.0	125.8
48	43.1	21.0	108	97.1	47.3	168	151.0	73.6	228	204.9	99.9	288	258.9	126.3
49	44.0	21.5	109	98.0	47.8	169	151.9	74.1	229	205.8	100.4	289	259.8	126.7
50	44.9	21.9	110	98.9	48.2	170	152.8	74.5	230	206.7	100.8	290	260.7	127.1
51	45.8	22.4	111	99.8	48.7	171	153.7	75.0	231	207.6	101.3	291	261.5	127.6
52	46.7	22.8	112	100.7	49.1	172	154.6	75.4	232	208.5	101.7	292	262.4	128.0
53	47.6	23.2	113	101.6	49.5	173	155.5	75.8	233	209.4	102.1	293	263.3	128.4
54	48.5	23.7	114	102.5	50.0	174	156.4	76.3	234	210.3	102.6	294	264.2	128.9
55	49.4	24.1	115	103.4	50.4	175	157.3	76.7	235	211.2	103.0	295	265.1	129.3
56	50.3	24.5	116	104.3	50.9	176	158.2	77.2	236	212.1	103.5	296	266.0	129.8
57	51.2	25.0	117	105.2	51.3	177	159.1	77.6	237	213.0	103.9	297	266.9	130.2
58	52.1	25.4	118	106.1	51.7	178	160.0	78.0	238	213.9	104.3	298	267.8	130.6
59	53.0	25.9	119	107.0	52.2	179	160.9	78.5	239	214.8	104.8	299	268.7	131.1
60	53.9	26.3	120	107.9	52.6	180	161.8	78.9	240	215.7	105.2	300	269.6	131.5
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 64 Degrees.

Difference of Latitude and Departure for 27 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	54.4	27.7	121	107.8	54.9	181	161.3	82.2	241	214.7	109.4
2	01.8	00.9	62	55.2	28.1	122	108.7	55.4	182	162.2	82.6	242	215.6	109.9
3	02.7	01.4	63	56.1	28.6	123	109.6	55.8	183	163.1	83.1	243	216.5	110 3
4	03.6	01.8	64	57.0	29.1	124	110.5	56.3	184	163.9	83.5	244	217.4	110.8
5	04.5	02.3	65	57.9	29.5	125	111.4	56.7	185	164.8	84.0	245	218.3	111.2
6	05.3	02.7	66	58.8	30.0	126	112.3	57.2	186	165.7	84.4	246	219.2	111.7
7	06.2	03.2	67	59.7	30.4	127	113.2	57.7	187	166.6	84.9	247	220.1	112.1
8	07.1	03.6	68	60.6	30.9	128	114.0	58.1	188	167.5	85.4	248	221.0	112.6
9	08.0	04.1	69	61.5	31.3	129	114.9	58.6	189	168.4	85.8	249	221.9	113.0
10	08.9	04.5	70	62.4	31.8	130	115.8	59.0	190	169.3	86.3	250	222.8	113.5
11	09.8	05.0	71	63.3	32.2	131	116.7	59.5	191	170.2	86.7	251	223.6	114.0
12	10.7	05.4	72	64.2	32.7	132	117.6	59.9	192	171.1	87.2	252	224.5	114.4
13	11.6	05.9	73	65.0	33.1	133	118.5	60.4	193	172.0	87.6	253	225.4	114.9
14	12.5	06.4	74	65.9	33.6	134	119.4	60.8	194	172.9	88.1	254	226.3	115.3
15	13.4	06.8	75	66.8	34.0	135	120.3	61.3	195	173.7	88.5	255	227.2	115.8
16	14.3	07.3	76	67.7	34.5	136	121.2	61.7	196	174.6	89.0	256	228.1	116.2
17	15.1	07.7	77	68.6	35.0	137	122.1	62.2	197	175.5	89.4	257	229.0	116.7
18	16.0	08.2	78	69.5	35.4	138	123.0	62.7	198	176.4	89.9	258	229.9	117.1
19	16.9	08.6	79	70.4	35.9	139	123.8	63.1	199	177.3	90.3	259	230.8	117.6
20	17.8	09.1	80	71.3	36.3	140	124.7	63.6	200	178.2	90.8	260	231.7	118.0
21	18.7	09.5	81	72.2	36.8	141	125.6	64.0	201	179.1	91.3	261	232.6	118.5
22	19.6	10.0	82	73.1	37.2	142	126.5	64.5	202	180.0	91.7	262	233.4	118.9
23	20.5	10.4	83	74.0	37.7	143	127.4	64.9	203	180.9	92.2	263	234.3	119.4
24	21.4	10.9	84	74.8	38.1	144	128.3	65.4	204	181.8	92.6	264	235.2	119.9
25	22.3	11.3	85	75.7	38.6	145	129.2	65.8	205	182.7	93.1	265	236.1	120.3
26	23.2	11.8	86	76.6	39.0	146	130.1	66.3	206	183.5	93.5	266	237.0	120.8
27	24.1	12.3	87	77.5	39.5	147	131.0	66.7	207	184.4	94.0	267	237.9	121.2
28	24.9	12.7	88	78.4	40.0	148	131.9	67.2	208	185.3	94.4	268	238.8	121.7
29	25 8	13.2	89	79.3	40.4	149	132.8	67.6	209	186.2	94.9	269	239.7	122.1
30	26.7	13.6	90	80.2	40.9	150	133.7	68.1	210	187.1	95.3	270	240.6	122.6
31	27.6	14.1	91	81.1	41.3	151	134.5	68.6	211	188.0	95.8	271	241.5	123.0
32	28.5	14.5	92	82.0	41.8	152	135.4	69.0	212	188.9	96.2	272	242.4	123.5
33	29.4	15.0	93	82.9	42.2	153	136.3	69.5	213	189.8	96.7	273	243.2	123.9
34	30.3	15.4	94	83.8	42.7	154	137.2	69.9	214	190.7	97.2	274	244.1	124.4
35	31.2	15.9	95	84.6	43.1	155	138.1	70.4	215	191.6	97.6	275	245.0	124.8
36	32.1	16.3	96	85.5	43.6	156	139.0	70.8	216	192.5	98.1	276	245.9	125.3
37	33.0	16.8	97	86.4	44.0	157	139.9	71.3	217	193.3	98.5	277	246.8	125.8
38	33.9	17.3	98	87.3	44.5	158	140.8	71.7	218	194.2	99.0	278	247.7	126.2
39	34.7	17.7	99	88.2	44.9	159	141.7	72.2	219	195.1	99.4	279	248.6	126.7
40	35.6	18.2	100	89.1	45.4	160	142.6	72.6	220	196.0	99.9	280	249.5	127.1
41	36.5	18.6	101	90.0	45.9	161	143.5	73.1	221	196.9	100.3	281	250.4	127.6
42	37.4	19.1	102	90.9	46.3	162	144.3	73.5	222	197.8	100.8	282	251.3	128.0
43	38.3	19.5	103	91.8	46.8	163	145.2	74.0	223	198.7	101.2	283	252.2	128.5
44	39.2	20.0	104	92.7	47.2	164	146.1	74.5	224	199.6	101.7	284	253.0	128.9
45	40.1	20.4	105	93.6	47.7	165	147.0	74.9	225	200.5	102.1	285	253.9	129.4
46	41.0	20.9	106	94.4	48.1	166	147.9	75.4	226	201.4	102.6	286	254.8	129.8
47	41.9	21.3	107	95.3	48.6	167	148.8	75.8	227	202.3	103.1	287	255.7	130 3
48	42.8	21.8	108	96.2	49.0	168	149.7	76.3	228	203.1	103.5	288	256.6	130.7
49	43.7	22.2	109	97.1	49.5	169	150.6	76.7	229	204.0	104.0	289	257.5	131.2
50	44.6	22.7	110	98.0	49.9	170	151.5	77.2	230	204.9	104.4	290	258.4	131.7
51	45.4	23.2	111	98.9	50.4	171	152.4	77.6	231	205.8	104.9	291	259.3	132.1
52	46.3	23.6	112	99.8	50.8	172	153.3	78.1	232	206.7	105.3	292	260.2	132.6
53	47.2	24.1	113	100.7	51.3	173	154.1	78.5	233	207.6	105.8	293	261.1	133.0
54	48.1	24.5	114	101.6	51.8	174	155.0	79.0	234	208.5	106.2	294	262.0	133.5
55	49.0	25.0	115	102.5	52.2	175	155.9	79.4	235	209.4	106.7	295	262.8	133.9
56	49.9	25.4	116	103.4	52.7	176	156.8	79.9	236	210.3	107.1	296	263.7	134.4
57	50.8	25.9	117	104.2	53.1	177	157.7	80.4	237	211.2	107.6	297	264.6	134.8
58	51.7	26.3	118	105.1	53.6	178	158.6	80.8	238	212.1	108.0	298	265.5	135.3
59	52.6	26.8	119	106.0	54.0	179	159.5	81.3	239	213.0	108.5	299	266.4	135.7
60	53.5	27.2	120	106.9	54.5	180	160.4	81.7	240	213.8	109.0	300	267.3	136.2
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 28 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	53.9	28.6	121	106.8	56.8	181	159.8	85.0	241	212.8	113 1
2	01.8	00.9	62	54.7	29.1	122	107.7	57.3	182	160.7	85.4	242	213.7	113 6
3	02.6	01.4	63	55.6	29.6	123	108.6	57.7	183	161.6	85.9	243	214.6	114.1
4	03.5	01.9	64	56.5	30.0	124	109.5	58.2	184	162.5	86.4	244	215.4	114.6
5	04.4	02.3	65	57.4	30.5	125	110.4	58.7	185	163.3	86.9	245	216.3	115.0
6	05.3	02.8	66	58.3	31.0	126	111.3	59.2	186	164.2	87.3	246	217.2	115.5
7	06.2	03.3	67	59.2	31.5	127	112.1	59.6	187	165.1	87.8	247	218.1	116.0
8	07.1	03.8	68	60.0	31.9	128	113.0	60.1	188	166.0	88.3	248	219.0	116.4
9	07.9	04.2	69	60.9	32.4	129	113.9	60.6	189	166.9	88.7	249	219.9	116.9
10	08.8	04.7	70	61.8	32.9	130	114.8	61.0	190	167.8	89.2	250	220.7	117.4
11	09.7	05.2	71	62.7	33.3	131	115.7	61.5	191	168.6	89.7	251	221.6	117.8
12	10.6	05.6	72	63.6	33.8	132	116.5	62.0	192	169.5	90.1	252	222.5	118.3
13	11.5	06 1	73	64.5	34.3	133	117.4	62.4	193	170.4	90.6	253	223.4	118.8
14	12.4	06.6	74	65.3	34.7	134	118.3	62.9	194	171.3	91.1	254	224.3	119.2
15	13.2	07.0	75	66.2	35.2	135	119.2	63.4	195	172.2	91.5	255	225.2	119.7
16	14.1	07.5	76	67.1	35.7	136	120.1	63.8	196	173.1	92.0	256	226.0	120.2
17	15.0	08.0	77	68.0	36.1	137	121.0	64.3	197	173.9	92.5	257	226.9	120.7
18	15.9	08.5	78	68.9	36.6	138	121.8	64.8	198	174.8	93.0	258	227.8	121.1
19	16.8	08.9	79	69.8	37.1	139	122.7	65.3	199	175.7	93.4	259	228.7	121.6
20	17.7	09.4	80	70.6	37.6	140	123.6	65.7	200	176.6	93.9	260	229.6	122.1
21	18.5	09.9	81	71.5	38.0	141	124.5	66.2	201	177.5	94.4	261	230.4	122.5
22	19.4	10.3	82	72.4	38.5	142	125.4	66.7	202	178.4	94.8	262	231.3	123.0
23	20.3	10.8	83	73.3	39.0	143	126.3	67.1	203	179.2	95.3	263	232.2	123.5
24	21.2	11.3	84	74.2	39.4	144	127.1	67.6	204	180.1	95.8	264	233.1	123.9
25	22.1	11.7	85	75.1	39.9	145	128.0	68.1	205	181.0	96.2	265	234.0	124.4
26	23.0	12.2	86	75.9	40.4	146	128.9	68.5	206	181.9	96.7	266	234.9	124.9
27	23.8	12.7	87	76.8	40.8	147	129.8	69.0	207	182.8	97.2	267	235.7	125.3
28	24.7	13.1	88	77.7	41.3	148	130.7	69.5	208	183.7	97.7	268	236.6	125.8
29	25.6	13.6	89	78.6	41.8	149	131.6	70.0	209	184.5	98.1	269	237.5	126.3
30	26.5	14.1	90	79.5	42.3	150	132.4	70.4	210	185.4	98 6	270	238.4	126.8
31	27.4	14.6	91	80.3	42.7	151	133.3	70.9	211	186.3	99.1	271	239.3	127.2
32	28.3	15.0	92	81.2	43.2	152	134.2	71.4	212	187.2	99.5	272	240.2	127.7
33	29.1	15.5	93	82.1	43.7	153	135.1	71.8	213	188.1	100.0	273	241.0	128.2
34	30.0	16.0	94	83.0	44.1	154	136.0	72.3	214	189.0	100.5	274	241.9	128.6
35	30.9	16.4	95	83.9	44.6	155	136.9	72.8	215	189.8	100.9	275	242.8	129.1
36	31.8	16.9	96	84.8	45.1	156	137.7	73.2	216	190.7	101.4	276	243.7	129.6
37	32.7	17.4	97	85.6	45.5	157	138.6	73.7	217	191.6	101.9	277	244.6	130.0
38	33.6	17.8	98	86.5	46.0	158	139.5	74.2	218	192.5	102.3	278	245.5	130.5
39	34.4	18.3	99	87.4	46.5	159	140.4	74.6	219	193.4	102.8	279	246.3	131.0
40	35.3	18.8	100	88.3	46.9	160	141.3	75.1	220	194.2	103.3	280	247.2	131.5
41	36.2	19.2	101	89.2	47.4	161	142.2	75.6	221	195.1	103.8	281	248.1	131.9
42	37.1	19.7	102	00.1	47.9	162	143.0	76.1	222	196.0	104.2	282	249.0	132.4
43	38.0	20.2	103	90.9	48.4	163	143.9	76.5	223	196.9	104.7	283	249.9	132.9
44	38.8	20.7	104	91.8	48.8	164	144.8	77.0	224	197.8	105.2	284	250.8	133.3
45	39.7	21.1	105	92.7	49.3	165	145.7	77.5	225	198.7	105.6	285	251.6	133.8
46	40.6	21.6	106	93.6	49.8	166	146.6	77.9	226	199.5	106.1	286	252.5	134.3
47	41.5	22.1	107	94.5	50.2	167	147.5	78.4	227	200.4	106.6	287	253.4	134.7
48	42.4	22.5	108	95.4	50.7	168	148.3	78.9	228	201.3	107.0	288	254.3	135.2
49	43.3	23.0	109	96.2	51.2	169	149.2	79.3	229	202.2	107.5	289	255.2	135.7
50	44.1	23.5	110	97.1	51.6	170	150.1	79.8	230	203.1	108.0	290	256.1	136.1
51	45.0	23.9	111	98.0	52.1	171	151.0	80.3	231	204.0	108.4	291	256.9	36.6
52	45.9	24.4	112	98.9	52.6	172	151.9	80.7	232	204.8	108.9	292	257.8	137.1
53	46.8	24.9	113	99.8	53.1	173	152.7	81.2	233	205.7	109.4	293	258.7	137.6
54	47.7	25.4	114	100.7	53.5	174	153.6	81.7	234	206.6	109.9	294	259.6	138.0
55	48.6	25.8	115	101.5	54.0	175	154.5	82.2	235	207.5	110.3	295	260.5	138.5
56	49.4	26.3	116	102.4	54.5	176	155.4	82.6	236	208.4	110.8	296	261.3	139.0
57	50.3	26.8	117	103.3	54.9	177	156.3	83.1	237	209.3	111.3	297	262.2	139.4
58	51.2	27.2	118	104.2	55.4	178	157.2	83.6	238	210.1	111.7	298	263.1	139.9
59	52.1	27.7	119	105.1	55.9	179	158.0	84.0	239	211.0	112.2	299	264.0	140.4
60	53.0	28.2	120	106.0	56.3	180	158.9	84.5	240	211.9	112.7	300	264.9	140.8
Dist	*Dep.*	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 29 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	53.4	29.6	121	105.8	58.7	181	158.3	87.8	241	210.8	116.8
2	01.7	01.0	62	54.2	30.1	122	106.7	59.1	182	159.2	88.2	242	211.7	117.3
3	02.6	01.5	63	55.1	30.5	123	107.6	59.6	183	160.1	88.7	243	212.5	117.8
4	03.5	01.9	64	56.0	31.0	124	108.5	60.1	184	160.9	89.2	244	213.4	118.3
5	04.4	02.4	65	56.9	31.5	125	109.3	60.6	185	161 8	89.7	245	214.3	118.8
6	05.2	02.9	66	57.7	32.0	126	110.2	61.1	186	162.7	90.2	246	215.2	119.3
7	06.1	03.4	67	58.6	32.5	127	111.1	61.6	187	163.6	90.7	247	216.0	119.7
8	07.0	03.9	68	59.5	33.0	128	112.0	62.1	188	164.4	91.1	248	216.9	120.2
9	07.9	04.4	69	60.3	33.5	129	112.8	62.5	189	165.3	91.6	249	217.8	120.7
10	08.7	04.8	70	61.2	33.9	130	113.7	63.0	190	166.2	92.1	250	218.7	121.2
11	09.6	05.3	71	62.1	34.4	131	114.6	63.5	191	167.1	92.6	251	219 5	121.7
12	10.5	05.8	72	63.0	34.9	132	115.4	64.0	192	167.9	93 1	252	220.4	122.2
13	11.4	06.3	73	63.8	35.4	133	116.3	64.5	193	168.8	93.6	253	221.3	122.7
14	12.2	06.8	74	64.7	35.9	134	117.2	65.0	194	169.7	94.1	254	222.2	123.1
15	13.1	07.3	75	65.6	36.4	135	118.1	65.4	195	170.6	94.5	255	223.0	123.6
16	14.0	07.8	76	66.5	36.8	136	118.9	65.9	196	171.4	95.0	256	223.9	124.1
17	14.9	08.2	77	67.3	37.3	137	119.8	66.4	197	172.3	95.5	257	224.8	124.6
18	15.7	08.7	78	68.2	37.8	138	120.7	66.9	198	173.2	96.0	258	225.7	125.1
19	16.6	09.2	79	69.1	38.3	139	121.6	67.4	199	174.0	96.5	259	226.5	125.6
20	17.5	09.7	80	70.0	38.8	140	122.4	67.9	200	174.9	97.0	260	227.4	126.1
21	18.4	10.2	81	70.8	39.3	141	123.3	68.4	201	175.8	97.4	261	228.3	126.5
22	19.2	10.7	82	71.7	39.8	142	124.2	68.8	202	176.7	97.9	262	229.2	127.0
23	20.1	11.2	83	72.6	40.2	143	125.1	69.3	203	177.5	98.4	263	230.0	127 5
24	21.0	11.6	84	73.5	40.7	144	125.9	69.8	204	178.4	98.9	264	230.9	128.0
25	21.9	12.1	85	74.3	41.2	145	126.8	70.3	205	179.3	99.4	265	231.8	128.5
26	22.7	12.6	86	75.2	41.7	146	127.7	70.8	206	180.2	99.9	266	232.6	129.0
27	23.6	13.1	87	76.1	42.2	147	128.6	71.3	207	181.0	100.4	267	233.5	129.4
28	24.5	13.6	88	77.0	42.7	148	129.4	71.8	208	181.9	100.8	268	234.4	129.9
29	25.4	14 1	89	77.8	43.1	149	130.3	72.2	209	182.8	101.3	269	235.3	130.4
30	26.2	14.5	90	78.7	43.6	150	131.2	72.7	210	183.7	101.8	270	236.1	130.9
31	27.1	15.0	91	79.6	44.1	151	132.1	73.2	211	184.5	102.3	271	237.0	131.4
32	28.0	15.5	92	80.5	44.6	152	132.9	73.7	212	185.4	102.8	272	237.9	131.9
33	28.9	16.0	93	81.3	45.1	153	133.8	74.2	213	186.3	103.3	273	238.8	132.4
34	29.7	16.5	94	82.2	45.6	154	134.7	74.7	214	187.2	103.7	274	239.6	132.8
35	30.6	17.0	95	83.1	46.1	155	135.6	75.1	215	188.0	104.2	275	240.5	133.3
36	31.5	17.5	96	84.0	46.5	156	136.4	75.6	216	188.9	104.7	276	241.4	133.8
37	32.4	17.9	97	84.8	47.0	157	137.3	76.1	217	189.8	105.2	277	242.3	134.3
38	33.2	18.4	98	85.7	47.5	158	138.2	76.6	218	190.7	105.7	278	243.1	134 8
39	34.1	18.9	99	86.6	48.0	159	139.1	77.1	219	191.5	106.2	279	244.0	135.3
40	35.0	19.4	100	87.5	48.5	160	139.9	77:6	220	192.4	106.7	280	244.9	135.7
41	35.9	19.9	101	88.3	49.0	161	140.8	78.1	221	193.3	107.1	281	245.8	136.2
42	36.7	20.4	102	89.2	49.5	162	141.7	78.5	222	194.2	107.6	282	246.6	136.7
43	37.6	20.8	103	90.1	49.9	163	142.6	79.0	223	195.0	108.1	283	247.5	137.2
44	38.5	21.3	104	91.0	50.4	164	143.4	79.5	224	195.9	108.6	284	248.4	137.7
45	39.4	21.8	105	91.8	50.9	165	144.3	80.0	225	196.8	109.1	285	249.3	138.2
46	40.2	22.3	106	92.7	51.4	166	145.2	80.5	226	197.7	109.6	286	250.1	138.7
47	41.1	22.8	107	93.6	51.9	167	146.1	81.0	227	198.5	110.1	287	251.0	139.1
48	42.0	23.3	108	94.5	52.4	168	146.9	81.4	228	199.4	110.5	288	251.9	139.6
49	42.9	23.8	109	95.3	52.8	169	147.8	81.9	229	200.3	111.0	289	252.8	140.1
50	43.7	24.2	110	96.2	53.3	170	148.7	82.4	230	201.2	111.5	290	253.6	140.6
51	44.6	24.7	111	97.1	53.8	171	149.6	82.9	231	202.0	112.0	291	254.5	141.1
52	45.5	25.2	112	98.0	54.3	172	150.4	83.4	232	202.9	112.5	292	255.4	141.6
53	46.4	25.7	113	98.8	54.8	173	151.3	83.9	233	203.8	113.0	293	256.3	142.0
54	47.2	26.2	114	99.7	55.3	174	152.2	84.4	234	204.7	113.4	294	257.1	142.5
55	48.1	26.7	115	100.6	55.8	175	153.1	84.8	235	205.5	113.9	295	258.0	143.0
56	49.0	27.1	116	101.5	56.2	176	153.9	85.3	236	206.4	114.4	296	258.9	143.5
57	49.9	27.6	117	102.3	56.7	177	154.8	85.8	237	207.3	114.9	297	259.8	144.0
58	50.7	28.1	118	103.2	57.2	178	155.7	86.3	238	208.2	115.4	298	260.6	144.5
59	51.6	28.6	119	104.1	57.7	179	156.6	86.8	239	209.0	115.9	299	261.5	145.0
60	52.5	29.1	120	105.0	58.2	180	157.4	87.3	240	209.9	116.4	300	262.4	145.4
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 30 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	52.8	30.5	121	104.8	60.5	181	156.8	90.5	241	208.7	120.5
2	01.7	01.0	62	53.7	31.0	122	105.7	61.0	182	157.6	91.0	242	209.6	121.0
3	02.6	01.5	63	54.6	31.5	123	106.5	61.5	183	158.5	91.5	243	210.4	121.5
4	03.5	02.0	64	55.4	32.0	124	107.4	62.0	184	159.3	92.0	244	211.3	122.0
5	04.3	02.5	65	56.3	32.5	125	108.3	62.5	185	160.2	92.5	245	212.2	122.5
6	05.2	03.0	66	57.2	33.0	126	109.1	63.0	186	161.1	93.0	246	213.0	123.0
7	06.1	03.5	67	58.0	33.5	127	110.0	63.5	187	161.9	93.5	247	213.9	123.5
8	06.9	04.0	68	58.9	34.0	128	110.9	64.0	188	162.8	94.0	248	214.8	124.0
9	07.8	04.5	69	59.8	34.5	129	111.7	64.5	189	163.7	94.5	249	215.6	124.5
10	08.7	05.0	70	60.6	35.0	130	112.6	65.0	190	164.5	95.0	250	216.5	125.0
11	09.5	05.5	71	61.5	35.5	131	113.4	65.5	191	165.4	95.5	251	217.4	125.5
12	10.4	06.0	72	62.4	36.0	132	114.3	66.0	192	166.3	96.0	252	218.2	126.0
13	11.3	06.5	73	63.2	36.5	133	115.2	66.5	193	167.1	96.5	253	219.1	126.5
14	12.1	07.0	74	64.1	37.0	134	116.0	67.0	194	168.0	97.0	254	220.0	127.0
15	13.0	07.5	75	65.0	37.5	135	116.9	67.5	195	168.9	97.5	255	220.8	127.5
16	13.9	08.0	76	65.8	38.0	136	117.8	68.0	196	169.7	98.0	256	221.7	128.0
17	14.7	08.5	77	66.7	38.5	137	118.6	68.5	197	170.6	98.5	257	222.6	128.5
18	15.6	09.0	78	67.5	39.0	138	119.5	69.0	198	171.5	99.0	258	223.4	129.0
19	16.5	09.5	79	68.4	39.5	139	120.4	69.5	199	172.3	99.5	259	224.3	129.5
20	17.3	10.0	80	69.3	40.0	140	121.2	70.0	200	173.2	100.0	260	225.2	130.0
21	18.2	10.5	81	70.1	40.5	141	122.1	70.5	201	174.1	100.5	261	226.0	130.5
22	19.1	11.0	82	71.0	41.0	142	123.0	71.0	202	174.9	101.0	262	226.9	131.0
23	19.9	11.5	83	71.9	41.5	143	123.8	71.5	203	175.8	101.5	263	227.8	131.5
24	20.8	12.0	84	72.7	42.0	144	124.7	72.0	204	176.7	102.0	264	228.6	132.0
25	21.7	12.5	85	73.6	42.5	145	125.6	72.5	205	177.5	102.5	265	229.5	132.5
26	22.5	13.0	86	74.5	43.0	146	126.4	73.0	206	178.4	103.0	266	230.4	133.0
27	23.4	13.5	87	75.3	43.5	147	127.3	73.5	207	179.3	103.5	267	231.2	133.5
28	24.2	14.0	88	76.2	44.0	148	128.2	74.0	208	180.1	104.0	268	232.1	134.0
29	25.1	14.5	89	77.1	44.5	149	129.0	74.5	209	181.0	104.5	269	233.0	134 5
30	26.0	15.0	90	77.9	45.0	150	129.9	75.0	210	181.9	105.0	270	233.8	135.0
31	26.8	15.5	91	78.8	45.5	151	130.8	75.5	211	182.7	105.5	271	234.7	135.5
32	27.7	16.0	92	79.7	46.0	152	131.6	76.0	212	183.6	106.0	272	235.6	136.0
33	28.6	16.5	93	80.5	46.5	153	132.5	76.5	213	184.5	106.5	273	236.4	136.5
34	29.4	17.0	94	81.4	47.0	154	133.4	77.0	214	185.3	107.0	274	237.3	137.0
35	30.3	17.5	95	82.3	47.5	155	134.2	77.5	215	186.2	107.5	275	238.2	137.5
36	31.2	18.0	96	83.1	48.0	156	135.1	78.0	216	187.1	108.0	276	239.0	138.0
37	32.0	18.5	97	84.0	48.5	157	136.0	78.5	217	187.9	108.5	277	239.9	138.5
38	32.9	19.0	98	84.9	49.0	158	136.8	79.0	218	188.8	109.0	278	240.8	139.0
39	33.8	19.5	99	85.7	49.5	159	137.7	79.5	219	189.7	109.5	279	241.6	139.5
40	34.6	20.0	100	86.6	50.0	160	138.6	80.0	220	190.5	110.0	280	242.5	140.0
41	35.5	20.5	101	87.5	50.5	161	139.4	80.5	221	191.4	110.5	281	243.4	140.5
42	36.4	21.0	102	88.3	51.0	162	140.3	81.0	222	192.3	111.0	282	244.2	141.0
43	37.2	21.5	103	89.2	51.5	163	141.2	81.5	223	193.1	111.5	283	245.1	141.5
44	38.1	22.0	104	90.1	52.0	164	142.0	82.0	224	194.0	112.0	284	246.0	142.0
45	39.0	22.5	105	90.9	52.5	165	142.9	82.5	225	194.9	112.5	285	246.8	142.5
46	39.8	23.0	106	91.8	53.0	166	143.8	83.0	226	195.7	113.0	286	247.7	143.0
47	40.7	23.5	107	92.7	53.5	167	144.6	83.5	227	196.6	113.5	287	248.5	143.5
48	41.6	24.0	108	93.5	54.0	168	145.5	84.0	228	197.5	114.0	288	249.4	144.0
49	42.4	24.5	109	94.4	54.5	169	146.4	84.5	229	198.3	114.5	289	250.3	144.5
50	43.3	25.0	110	95.3	55.0	170	147.2	85.0	230	199.2	115.0	290	251.1	145.0
51	44.2	25.5	111	96.1	55.5	171	148.1	85.5	231	200.1	115.5	291	252.0	145.5
52	45.0	26.0	112	97.0	56.0	172	149.0	86.0	232	200.9	116.0	292	252.9	146.0
53	45.9	26.5	113	97.9	56.5	173	149.8	86.5	233	201.8	116.5	293	253.7	146.5
54	46.8	27.0	114	98.7	57.0	174	150.7	87.0	234	202.6	117.0	294	254.6	147.0
55	47.6	27.5	115	99.6	57.5	175	151.6	87.5	235	203.5	117.5	295	255.5	147.5
56	48.5	28.0	116	100.5	58.0	176	152.4	88.0	236	204.4	118.0	296	256.3	148.0
57	49.4	28.5	117	101.3	58.5	177	153.3	88.5	237	205.2	118.5	297	257.2	148.5
58	50.2	29.0	118	102.2	59.0	178	154.2	89.0	238	206.1	119.0	298	258.1	149.0
59	51.1	29.5	119	103.1	59.5	179	155.0	89.5	239	207.0	119.5	299	258.9	149.5
60	52.0	30.0	120	103.9	60.0	180	155.9	90.0	240	207.8	120.0	300	259.8	150.0
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 60 Degrees.

Difference of Latitude and Departure for 31 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	52.3	31.4	121	103.7	62.3	181	155.1	93.2	241	206.6	124.1
2	01.7	01.0	62	53.1	31.9	122	104.6	62.8	182	156.0	93.7	242	207.4	124.6
3	02.6	01.5	63	54.0	32.4	123	105.4	63.3	183	156.9	94.3	243	208.3	125.2
4	03.4	02.1	64	54.9	33.0	124	106.3	63.9	184	157.7	94.8	244	209.1	125.7
5	04.3	02.6	65	55.7	33.5	125	107.1	64.4	185	158.6	95.3	245	210.0	126.2
6	05.1	03.1	66	56.6	34.0	126	108.0	64.9	186	159.4	95.8	246	210.9	126.7
7	06.0	03.6	67	57.4	34.5	127	108.9	65.4	187	160.3	96.3	247	211.7	127.2
8	06.9	04.1	68	58.3	35.0	128	109.7	65.9	188	161.1	96.8	248	212.6	127.7
9	07.7	04.6	69	59.1	35.5	129	110.6	66.4	189	162.0	97.3	249	213.4	128.2
10	08.6	05.2	70	60.0	36.1	130	111.4	67.0	190	162.9	97.9	250	214.3	128.8
11	09.4	05.7	71	60.9	36.6	131	112.3	67.5	191	163.7	98.4	251	215.1	129.3
12	10.3	06.2	72	61.7	37.1	132	113.1	68.0	192	164.6	98.9	252	216.0	129.8
13	11.1	06.7	73	62.6	37.6	133	114.0	68.5	193	165.4	99.4	253	216.9	130.3
14	12.0	07.2	74	63.4	38.1	134	114.9	69.0	194	166.3	99.9	254	217.7	130.8
15	12.9	07.7	75	64.3	38.6	135	115.7	69.5	195	167.1	100.4	255	218.6	131.3
16	13.7	08.2	76	65.1	39.1	136	116.6	70.0	196	168.0	100.9	256	219.4	131.8
17	14.6	08.8	77	66.0	39.7	137	117.4	70.6	197	168.9	101.5	257	220.3	132.4
18	15.4	09.3	78	66.9	40.2	138	118.3	71.1	198	169.7	102.0	258	221.1	132.9
19	16.3	09.8	79	67.7	40.7	139	119.1	71.6	199	170.6	102.5	259	222.0	133.4
20	17.1	10.3	80	68.6	41.2	140	120.0	72.1	200	171.4	103.0	260	222.9	133.9
21	18.0	10.8	81	69.4	41.7	141	120.9	72.6	201	172.3	103.5	261	223.7	134.4
22	18.9	11.3	82	70.3	42.2	142	121.7	73.1	202	173.1	104.0	262	224.6	134.9
23	19.7	11.8	83	71.1	42.7	143	122.6	73.7	203	174.0	104.6	263	225.4	135.5
24	20.6	12.4	84	72.0	43.3	144	123.4	74.2	204	174.9	105.1	264	226.3	136.0
25	21.4	12.9	85	72.9	43.8	145	124.3	74.7	205	175.7	105.6	265	227.1	136.5
26	22.3	13.4	86	73.7	44.3	146	125.1	75.2	206	176.6	106.1	266	228.0	137.0
27	23.1	13.9	87	74.6	44.8	147	126.0	75.7	207	177.4	106.6	267	228.9	137.5
28	24.0	14.4	88	75.4	45.3	148	126.9	76.2	208	178.3	107.1	268	229.7	138.0
29	24.9	14.9	89	76.3	45.8	149	127.7	76.7	209	179.1	107.6	269	230.6	138.5
30	25.7	15.5	90	77.1	46.4	150	128.6	77.3	210	180.0	108.2	270	231.4	139.1
31	26.6	16.0	91	78.0	46.9	151	129.4	77.8	211	180.9	108.7	271	232.3	139.6
32	27.4	16.5	92	78.9	47.4	152	130.3	78.3	212	181.7	109.2	272	233.1	140.1
33	28.3	17.0	93	79.7	47.9	153	131.1	78.8	213	182.6	109.7	273	234.0	140.6
34	29.1	17.5	94	80.6	48.4	154	132.0	79.3	214	183.4	110.2	274	234.9	141.1
35	30.0	18.0	95	81.4	48.9	155	132.9	79.8	215	184.3	110.7	275	235.7	141.6
36	30.9	18.5	96	82.3	49.4	156	133.7	80.3	216	185.1	111.2	276	236.6	142.2
37	31.7	19.1	97	83.1	50.0	157	134.6	80.9	217	186.0	111.8	277	237.4	142.7
38	32.6	19.6	98	84.0	50.5	158	135.4	81.4	218	186.9	112.3	278	238.3	143.2
39	33.4	20.1	99	84.9	51.0	159	136.3	81.9	219	187.7	112.8	279	239.1	143.7
40	34.3	20.6	100	85.7	51.5	160	137.1	82.4	220	188.6	113.3	280	240.0	144.2
41	35.1	21.1	101	86.6	52.0	161	138.0	82.9	221	189.4	113.8	281	240.9	144.7
42	36.0	21.6	102	87.4	52.5	162	138.9	83.4	222	190.3	114.3	282	241.7	145.2
43	36.9	22.1	103	88.3	53.0	163	139.7	84.0	223	191.1	114.9	283	242.6	145.8
44	37.7	22.7	104	89.1	53.6	164	140.6	84.5	224	192.0	115.4	284	243.4	146.3
45	38.6	23.2	105	90.0	54.1	165	141.4	85.0	225	192.9	115.9	285	244.3	146.8
46	39.4	23.7	106	90.9	54.6	166	142.3	85.5	226	193.7	116.4	286	245.1	147.3
47	40.3	24.2	107	91.7	55.1	167	143.1	86.0	227	194.6	116.9	287	246.0	147.8
48	41.1	24.7	108	92.6	55.6	168	144.0	86.5	228	195.4	117.4	288	246.9	148.3
49	42.0	25.2	109	93.4	56.1	169	144.9	87.0	229	196.3	117.9	289	247.7	148.8
50	42.9	25.8	110	94.3	56.7	170	145.7	87.6	230	197.1	118.5	290	248.6	149.4
51	43.7	26.3	111	95.1	57.2	171	146.6	88.1	231	198.0	119.0	291	249.4	149.9
52	44.6	26.8	112	96.0	57.7	172	147.4	88.6	232	198.9	119.5	292	250.3	150.4
53	45.4	27.3	113	96.9	58.2	173	148.3	89.1	233	199.7	120.0	293	251.2	150.9
54	46.3	27.8	114	97.7	58.7	174	149.1	89.6	234	200.6	120.5	294	252.0	151.4
55	47.1	28.3	115	98.6	59.2	175	150.0	90.1	235	201.4	121.0	295	252.9	151.9
56	48.0	28.8	116	99.4	59.7	176	150.9	90.6	236	202.3	121.5	296	253.7	152.5
57	48.9	29.4	117	100.3	60.3	177	151.7	91.2	237	203.1	122.1	297	254.6	153.0
58	49.7	29.9	118	101.1	60.8	178	152.6	91.7	238	204.0	122.6	298	255.4	153.5
59	50.6	30.4	119	102.0	61.3	179	153.4	92.2	239	204.9	123.1	299	256.3	154.0
60	51.4	30.9	120	102.9	61.8	180	154.3	92.7	240	205.7	123.6	300	257.1	154.5
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 59 Degrees.

TABLE II.

Difference of Latitude and Departure for 32 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.5	61	51.7	32.3	121	102.6	64.1	181	153.5	95.9	241	204.4	127.7
2	01.7	01.1	62	52.6	32.9	122	103.5	64.7	182	154.3	96.4	242	205.2	128.2
3	02.5	01.6	63	53.4	33.4	123	104.3	65.2	183	155.2	97.0	243	206.1	128.8
4	03.4	02.1	64	54.3	33.9	124	105.2	65.7	184	156.0	97.5	244	206.9	129.3
5	04.2	02.6	65	55.1	34.4	125	106.0	66.2	185	156.9	98.0	245	207.8	129.8
6	05.1	03.2	66	56.0	35.0	126	106.9	66.8	186	157.7	98.6	246	208.6	130.4
7	05.9	03.7	67	56.8	35.5	127	107.7	67.3	187	158.6	99.1	247	209.5	130.9
8	06.8	04.2	68	57.7	36.0	128	108.6	67.8	188	159.4	99.6	248	210.3	131.4
9	07.6	04.8	69	58.5	36.6	129	109.4	68.4	189	160.3	100.2	249	211.2	131.9
10	08.5	05.3	70	59 4	37.1	130	110.2	68.9	190	161.1	100.7	250	212.0	132.5
11	09.3	05.8	71	60.2	37.6	131	111.1	69.4	191	162.0	101.2	251	212.9	133.0
12	10.2	06.4	72	61.1	38.2	132	111.9	69.9	192	162.8	101.7	252	213.7	133.5
13	11.0	06.9	73	61.9	38.7	133	112.8	70.5	193	163.7	102.3	253	214.6	134.1
14	11.9	07.4	74	62.8	39.2	134	113.6	71.0	194	164.5	102.8	254	215.4	134.6
15	12.7	07.9	75	63.6	39.7	135	114.5	71.5	195	165.4	103.3	255	216.3	135.1
16	13.6	08.5	76	64.5	40.3	136	115.3	72.1	196	166.2	103.9	256	217.1	135.7
17	14.4	09.0	77	65.3	40.8	137	116.2	72.6	197	167.1	104.4	257	217.9	136.2
18	15.3	09.5	78	66.1	41.3	138	117.0	73.1	198	167.9	104.9	258	218.8	136.7
19	16.1	10.1	79	67.0	41.9	139	117.9	73.7	199	168.8	105.5	259	219.6	137.2
20	17.0	10.6	80	67.8	42.4	140	118.7	74.2	200	169.6	106.0	260	220.5	137.8
21	17.8	11.1	81	68.7	42.9	141	119.6	74.7	201	170.5	106.5	261	221.3	138.3
22	18.7	11.7	82	69.5	43.5	142	120.4	75.2	202	171.3	107.0	262	222.2	138.8
23	19.5	12.2	83	70.4	44.0	143	121.3	75.8	203	172.2	107.6	263	223.0	139.4
24	20.4	12.7	84	71.2	44.5	144	122.1	76.3	204	173.0	108.1	264	223.9	139.9
25	21.2	13.2	85	72.1	45.0	145	123.0	76.8	205	173.8	108.6	265	224.7	140.4
26	22.0	13.8	86	72.9	45.6	146	123.8	77.4	206	174.7	109.2	266	225.6	141.0
27	22.9	14.3	87	73.8	46.1	147	124.7	77.9	207	175.5	109.7	267	226.4	141.5
28	23.7	14.8	88	74.6	46.6	148	125.5	78.4	208	176.4	110.2	268	227.3	142.0
29	24.6	15.4	89	75.5	47.2	149	126.4	79.0	209	177.2	110.8	269	228.1	142.5
30	25.4	15.9	90	76.3	47.7	150	127.2	79.5	210	178.1	111.3	270	229.0	143.1
31	26.3	16.4	91	77.2	48.2	151	128.1	80.0	211	178.9	111.8	271	229.8	143.6
32	27.1	17.0	92	78.0	48.8	152	128.9	80.5	212	179.8	112.3	272	230.7	144.1
33	28.0	17.5	93	78.9	49.3	153	129.8	81.1	213	180.6	112.9	273	231.5	144.7
34	28.8	18.0	94	79.7	49.8	154	130.6	81.6	214	181.5	113.4	274	232.4	145.2
35	29.7	18.5	95	80.6	50 3	155	131.4	82.1	215	182.3	113.9	275	233.2	145.7
36	30.5	19.1	96	81.4	50.9	156	132.3	82.7	216	183.2	114.5	276	234.1	146.3
37	31.4	19.6	97	82.3	51.4	157	133.1	83.2	217	184.0	115.0	277	234.9	146.8
38	32.2	20.1	98	83.1	51.9	158	134.0	83.7	218	184.9	115.5	278	235.8	147.3
39	33.1	20.7	99	84.0	52.5	159	134.8	84.3	219	185.7	116.1	279	236.6	147.8
40	33.9	21.2	100	84.8	53.0	160	135.7	84.8	220	186.6	116.6	280	237.5	148.4
41	34.8	21.7	101	85.7	53.5	161	136.5	85.3	221	187.4	117.1	281	238.3	148.9
42	35.6	22.3	102	86.5	54.1	162	137.4	85.8	222	188.3	117.6	282	239.1	149.4
43	36.5	22.8	103	87.3	54.6	163	138.2	86.4	223	189.1	118.2	283	240.0	150.0
44	37.3	23.3	104	88.2	55.1	164	139 1	86.9	224	190.0	118.7	284	240.8	150.5
45	38.2	23.8	105	89.0	55.6	165	139.9	87.4	225	190.8	119.2	285	241.7	151.0
46	39.0	24.4	106	89.9	56.2	166	140.8	88.0	226	191.7	119.8	286	242.5	151.6
47	39.9	24.9	107	90.7	56.7	167	141.6	88.5	227	192 5	120.3	287	243.4	152.1
48	40.7	25.4	108	91.6	57.2	168	142.5	89.0	228	193.4	120.3	288	244.2	152.6
49	41.6	26.0	109	92.4	57.8	169	143.3	89.6	229	194.2	121.4	289	245.1	153.1
50	42.4	26.5	110	93.3	58.3	170	144.2	90.1	230	195.1	121.9	290	245.9	153.7
51	43.3	27.0	111	94.1	58.8	171	145.0	90.6	231	195.9	122.4	291	246.8	154.2
52	44.1	27.6	112	95.0	59.4	172	145.9	91.1	232	196.7	122.9	292	247.6	154.7
53	44.9	28.1	113	95.8	59.9	173	146.7	91.7	233	197.6	123.5	293	248.5	155.3
54	45.8	28.6	114	96.7	60.4	174	147 6	92.2	234	198.4	124.0	294	249.3	155.8
55	46.6	29.1	115	97.5	60.9	175	148.4	92.7	235	199.3	124.5	295	250.2	156.3
56	47.5	29.7	116	98.4	61.5	176	149.3	93.3	236	200.1	125.1	296	251.0	156.9
57	48.3	30.2	117	99.2	62.0	177	150.1	93.8	237	201.0	125.6	297	251.9	157 4
58	49.2	30.7	118	100.1	62.5	178	151.0	94.3	238	201.8	126.1	298	252.7	157.9
59	50.0	31.3	119	100.9	63.1	179	151 8	94.9	239	202.7	126.7	299	253.6	158.4
60	50.9	31.8	120	101.8	63.6	180	152.6	95.4	240	203.5	127.2	300	254.4	159.0
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 33 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.5	61	51.2	33.2	121	101.5	65.9	181	151.8	98.6	241	202.1	131.3
2	01.7	01.1	62	52.0	33.8	122	102.3	66.4	182	152.6	99.1	242	203.0	131.8
3	02.5	01.6	63	52.8	34.3	123	103.2	67.0	183	153.5	99.7	243	203.8	132.3
4	03.4	02.2	64	53.7	34.9	124	104.0	67.5	184	154.3	100.2	244	204.6	132.9
5	04.2	02.7	65	54.5	35.4	125	104.8	68.1	185	155.2	100.8	245	205.5	133.4
6	05.0	03.3	66	55.4	35.9	126	105.7	68.6	186	156.0	101.3	246	206.3	134.0
7	05.9	03.8	67	56.2	36.5	127	106.5	69.2	187	156.8	101.8	247	207.2	134.5
8	06.7	04.4	68	57.0	37.0	128	107.3	69.7	188	157.7	102.4	248	208.0	135.1
9	07.5	04.9	69	57.9	37.6	129	108.2	70.3	189	158.5	102.9	249	208.8	135.6
10	08.4	05.4	70	58.7	38.1	130	109.0	70.8	190	159.3	103.5	250	209.7	136.2
11	09.2	06.0	71	59.5	38.7	131	109.9	71.3	191	160.2	104.0	251	210.5	136.7
12	10.1	06.5	72	60.4	39.2	132	110.7	71.9	192	161.0	104.6	252	211.3	137.2
13	10.9	07.1	73	61.2	39.8	133	111.5	72.4	193	161.9	105.1	253	212.2	137.8
14	11.7	07.6	74	62.1	40.3	134	112.4	73.0	194	162.7	105.7	254	213.0	138.3
15	12.6	08.2	75	62.9	40.8	135	113.2	73.5	195	163.5	106.2	255	213.9	138.9
16	13.4	08.7	76	63.7	41.4	136	114.1	74.1	196	164.4	106.7	256	214.7	139.4
17	14.3	09.3	77	64.6	41.9	137	114.9	74.6	197	165.2	107.3	257	215.5	140.0
18	15.1	09.8	78	65.4	42.5	138	115.7	75.2	198	166.1	107.8	258	216.4	140.5
19	15.9	10.3	79	66.3	43.0	139	116.6	75.7	199	166.9	108.4	259	217.2	141.1
20	16.8	10.9	80	67.1	43.6	140	117.4	76.2	200	167.7	108.9	260	218.1	141.6
21	17.6	11.4	81	67.9	44.1	141	118.3	76.8	201	168.6	109.5	261	218.9	142.2
22	18.5	12.0	82	68.8	44.7	142	119.1	77.3	202	169.4	110.0	262	219.7	142.7
23	19.3	12.5	83	69.6	45.2	143	119.9	77.9	203	170.3	110.6	263	220.6	143.2
24	20.1	13.1	84	70.4	45.7	144	120.8	78.4	204	171.1	111.1	264	221.4	143.8
25	21.0	13.6	85	71.3	46.3	145	121.6	79.0	205	171.9	111.7	265	222.2	144.3
26	21.8	14.2	86	72.1	46.8	146	122.4	79.5	206	172.8	112.2	266	223.1	144.9
27	22.6	14.7	87	73.0	47.4	147	123.3	80.1	207	173.6	112.7	267	223.9	145.4
28	23.5	15.2	88	73.8	47.9	148	124.1	80.6	208	174.4	113.3	268	224.8	146.0
29	24.3	15.8	89	74.6	48.5	149	125.0	81.2	209	175.3	113.8	269	225.6	146.5
30	25.2	16.3	90	75.5	49.0	150	125.8	81.7	210	176.1	114.4	270	226.4	147.1
31	26.0	16.9	91	76.3	49.6	151	126.6	82.2	211	177.0	114.9	271	227.3	147.6
32	26.8	17.4	92	77.2	50.1	152	127.5	82.8	212	177.8	115.5	272	228.1	148.1
33	27.7	18.0	93	78.0	50.7	153	128.3	83.3	213	178.6	116.0	273	229.0	148.7
34	28.5	18.5	94	78.8	51.2	154	129.2	83.9	214	179.5	116.6	274	229.8	149.2
35	29.4	19.1	95	79.7	51.7	155	130.0	84.4	215	180.3	117.1	275	230.6	149.8
36	30.2	19.6	96	80.5	52.3	156	130.8	85.0	216	181.2	117.6	276	231.5	150.3
37	31.0	20.2	97	81.4	52.8	157	131.7	85.5	217	182.0	118.2	277	232.3	150.9
38	31.9	20.7	98	82.2	53.4	158	132.5	86.1	218	182.8	118.7	278	233.2	151.4
39	32.7	21.2	99	83.0	53.9	159	133.3	86.6	219	183.7	119.3	279	234.0	152.0
40	33.5	21.8	100	83.9	54.5	160	134.2	87.1	220	184.5	119.8	280	234.8	152.5
41	34.4	22.3	101	84.7	55.0	161	135.0	87.7	221	185.3	120.4	281	235.7	153.0
42	35.2	22.9	102	85.5	55.6	162	135.9	88.2	222	186.2	120.9	282	236.5	153.6
43	36.1	23.4	103	86.4	56.1	163	136.7	88.8	223	187.0	121.5	283	237.3	154.1
44	36.9	24.0	104	87.2	56.6	164	137.5	89.3	224	187.9	122.0	284	238.2	154.7
45	37.7	24.5	105	88.1	57.2	165	138.4	89.9	225	188.7	122.5	285	239.0	155.2
46	38.6	25.1	106	88.9	57.7	166	139.2	90.4	226	189.5	123.1	286	239.9	155.8
47	39.4	25.6	107	89.7	58.3	167	140.1	91.0	227	190.4	123.6	287	240.7	156.3
48	40.3	26.1	108	90.6	58.8	168	140.9	91.5	228	191.2	124.2	288	241.5	156.9
49	41.1	26.7	109	91.4	59.4	169	141.7	92.0	229	192.1	124.7	289	242.4	157.4
50	41.9	27.2	110	92.3	59.9	170	142.6	92.6	230	192.9	125.3	290	243.2	157.9
51	42.8	27.8	111	93.1	60.5	171	143.4	93.1	231	193.7	125.8	291	244.1	158.5
52	43.6	28.3	112	93.9	61.0	172	144.3	93.7	232	194.6	126.4	292	244.9	159.0
53	44.4	28.9	113	94.8	61.5	173	145.1	94.2	233	195.4	126.9	293	245.7	159.6
54	45.3	29.4	114	95.6	62.1	174	145.9	94.8	234	196.2	127.4	294	246.6	160.1
55	46.1	30.0	115	96.4	62.6	175	146.8	95.3	235	197.1	128.0	295	247.4	160.7
56	47.0	30.5	116	97.3	63.2	176	147.6	95.9	236	197.9	128.5	296	248.2	161.2
57	47.8	31.0	117	98.1	63.7	177	148.4	96.4	237	198.8	129.1	297	249.1	161.8
58	48.6	31.6	118	99.0	64.3	178	149.3	96.9	238	199.6	129.6	298	249.9	162.3
59	49.5	32.1	119	99.8	64.8	179	150.1	97.5	239	200.4	130.2	299	250.8	162.8
60	50.3	32.7	120	100.6	65.4	180	151.0	98.0	240	201.3	130.7	300	251.6	163.4
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 34 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	50.6	34.1	121	100.3	67.7	181	150.1	101.2	241	199.8	134.8
2	01.7	01.1	62	51.4	34.7	122	101.1	68.2	182	150.9	101.8	242	200.6	135.3
3	02.5	01.7	63	52.2	35.2	123	102.0	68.8	183	151.7	102.3	243	201.5	135.9
4	03.3	02.2	64	53.1	35.8	124	102.8	69.3	184	152.5	102.9	244	202.3	136.4
5	04.1	02.8	65	53.9	36.3	125	103.6	69.9	185	153.4	103.5	245	203.1	137.0
6	05.0	03.4	66	54.7	36.9	126	104.5	70.5	186	154.2	104.0	246	203.9	137.6
7	05.8	03.9	67	55.5	37.5	127	105.3	71.0	187	155.0	104.6	247	204.8	138.1
8	06.6	04.5	68	56.4	38.0	128	106.1	71.6	188	155.9	105.1	248	205.6	138.7
9	07.5	05 0	69	57.2	38.6	129	106.9	72.1	189	156.7	105.7	249	206.4	139.2
10	08.3	05.6	70	58.0	39.1	130	107.8	72.7	190	157.5	106.2	250	207.3	139.8
11	09.1	06.2	71	58.9	39.7	131	108.6	73.3	191	158.3	106.8	251	208.1	140.4
12	09.9	06.7	72	59.7	40.3	132	109.4	73.8	192	159.2	107.4	252	208.9	140.9
13	10.8	07.3	73	60.5	40.8	133	110.3	74.4	193	160.0	107.9	253	209.7	141.5
14	11.6	07.8	74	61.3	41.4	134	111.1	74.9	194	160.8	108.5	254	210.6	142.0
15	12.4	08.4	75	62.2	41.9	135	111.9	75.5	195	161.7	109.0	255	211.4	142.6
16	13.3	08.9	76	63.0	42.5	136	112.7	76.1	196	162.5	109.6	256	212.2	143.2
17	14.1	09.5	77	63.8	43.1	137	113.6	76.6	197	163.3	110.2	257	213.1	143.7
18	14.9	10.1	78	64.7	43.6	138	114.4	77.2	198	164.1	110.7	258	213.9	144.3
19	15.8	10.6	79	65.5	44.2	139	115.2	77.7	199	165.0	111.3	259	214.7	144.8
20	16.6	11.2	80	66.3	44.7	140	116.1	78.3	200	165.8	111.8	260	215.5	145.4
21	17.4	11.7	81	67.2	45.3	141	116.9	78.8	201	166.6	112.4	261	216.4	145.9
22	18.2	12.3	82	68.0	45.9	142	117.7	79.4	202	167.5	113.0	262	217.2	146.5
23	19.1	12.9	83	68.8	46.4	143	118.6	80.0	203	168.3	113.5	263	218.0	147.1
24	19.9	13.4	84	69.6	47.0	144	119.4	80.5	204	169.1	114.1	264	218.9	147.6
25	20.7	14.0	85	70.5	47.5	145	120.2	81.1	205	170.0	114.6	265	219.7	148.2
26	21.6	14.5	86	71.3	48.1	146	121.0	81.6	206	170.8	115.2	266	220.5	148.7
27	22.4	15.1	87	72.1	48.6	147	121.9	82.2	207	171.6	115.8	267	221.4	149.3
28	23.2	15.7	88	73.0	49.2	148	122.7	82.8	208	172.4	116.3	268	222.2	149.9
29	24.0	16.2	89	73.8	49.8	149	123.5	83.3	209	173.3	116.9	269	223.0	150.4
30	24.9	16.8	90	74.6	50.3	150	124.4	83.9	210	174.1	117.4	270	223.8	151.0
31	25.7	17.3	91	75.4	50.9	151	125.2	84.4	211	174.9	118.0	271	224.7	151.5
32	26.5	17.9	92	76.3	51.4	152	126.0	85.0	212	175.8	118.5	272	225.5	152.1
33	27.4	18.5	93	77.1	52.0	153	126.8	85.6	213	176.6	119.1	273	226.3	152.7
34	28.2	19.0	94	77.9	52.6	154	127.7	86.1	214	177.4	119.7	274	227.2	153.2
35	29.0	19.6	95	78.8	53.1	155	128.5	86.7	215	178.2	120.2	275	228.0	153.8
36	29.8	20.1	96	79.6	53.7	156	129.3	87.2	216	179.1	120.8	276	228.8	154.3
37	30.7	20.7	97	80.4	54.2	157	130.2	87.8	217	179.9	121.3	277	229.6	154.9
38	31.5	21.2	98	81.2	54.8	158	131.0	88.4	218	180.7	121.9	278	230.5	155.5
39	32.3	21.8	99	82.1	55.4	159	131.8	88.9	219	181.6	122.5	279	231.3	156.0
40	33.2	22.4	100	82.9	55.9	160	132.6	89.5	220	182.4	123.0	280	232.1	156.6
41	34.0	22.9	101	83.7	56.5	161	133.5	90.0	221	183.2	123.6	281	233.0	157.1
42	34.8	23.5	102	84.6	57.0	162	134.3	90.6	222	184.0	124.1	282	233.8	157.7
43	35.6	24.0	103	85.4	57.6	163	135.1	91.1	223	184.9	124.7	283	234.6	158.3
44	36.5	24.6	104	86.2	58.2	164	136.0	91.7	224	185.7	125.3	284	235.4	158.8
45	37.3	25.2	105	87.0	58.7	165	136.8	92.3	225	186.5	125.8	285	236.3	159.4
46	38.1	25.7	106	87.9	59.3	166	137.6	92.8	226	187.4	126.4	286	237.1	159.9
47	39.0	26.3	107	88.7	59.8	167	138.4	93.4	227	188.2	126.9	287	237.9	160.5
48	39.8	26.8	108	89.5	60.4	168	139.3	93.9	228	189.0	127.5	288	238.8	161.0
49	40.6	27.4	109	90.4	61.0	169	140.1	94.5	229	189.8	128.1	289	239.6	161.6
50	41.5	28.0	110	91.2	61.5	170	140.9	95.1	230	190.7	128.6	290	240.4	162.2
51	42.3	28.5	111	92.0	62.1	171	141.8	95.6	231	191.5	129.2	291	241.2	162.7
52	43.1	29.1	112	92.9	62.6	172	142.6	96.2	232	192.3	129.7	292	242.1	163.3
53	43.9	29.6	113	93.7	63.2	173	143.4	96.7	233	193.2	130.3	293	242.9	163.8
54	44.8	30.2	114	94.5	63.7	174	144.3	97.3	234	194.0	130.9	294	243.7	164.4
55	45.6	30.8	115	95.3	64.3	175	145.1	97.9	235	194.8	131.4	295	244.6	165.0
56	46.4	31.3	116	96.2	64.9	176	145.9	98.4	236	195.7	132.0	296	245.4	165.5
57	47.3	31.9	117	97.0	65.4	177	146.7	99.0	237	196.5	132.5	297	246.2	166.1
58	48.1	32.4	118	97.8	66.0	178	147.6	99.5	238	197.3	133.1	298	247.1	166.6
59	48.9	33.0	119	98.7	66.5	179	148.4	100.1	239	198.1	133.6	299	247.9	167.2
60	49.7	33.6	120	99.5	67.1	180	149.2	100.7	240	199.0	134.2	300	248.7	167.8
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 56 Degrees.

Difference of Latitude and Departure for 35 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	50.0	35.0	121	99.1	69.4	181	148.3	103.8	241	197.4	138.2
2	01.6	01.1	62	50.8	35 6	122	99.9	70.0	182	149.1	104.4	242	198.2	138.8
3	02.5	01.7	63	51.6	36 1	123	100.8	70.5	183	149.9	105.0	243	199.1	139.4
4	03.3	02.3	64	52.4	36.7	124	101.6	71.1	184	150.7	105.5	244	199.9	140.0
5	04.1	02.9	65	53.2	37.3	125	102.4	71.7	185	151.5	106.1	245	200.7	140.5
6	04.9	03.4	66	54.1	37.9	126	103.2	72.3	186	152.4	106.7	246	201.5	141.1
7	05.7	04.0	67	54.9	38.4	127	104.0	72.8	187	153.2	107.3	247	202.3	141.7
8	06.6	04.6	68	55.7	39.0	128	104.9	73.4	188	154.0	107.8	248	203.1	142.2
9	07.4	05.2	69	56.5	39.6	129	105.7	74.0	189	154.8	108.4	249	204.0	142.8
10	08.2	05.7	70	57.3	40.2	130	106.5	74.6	190	155.6	109.0	250	204.8	143.4
11	09.0	06.3	71	58.2	40.7	131	107.3	75.1	191	156.5	109.6	251	205.6	144.0
12	09.8	06.9	72	59.0	41.3	132	108.1	75.7	192	157.3	110.1	252	206.4	144.5
13	10.6	07.5	73	59.8	41.9	133	108.9	76.3	193	158.1	110.7	253	207.2	145.1
14	11.5	08.0	74	60.6	42.4	134	109.8	76.9	194	158.9	111.3	254	208.1	145.7
15	12.3	08.6	75	61.4	43.0	135	110.6	77.4	195	159.7	111.8	255	208.9	146.3
16	13.1	09.2	76	62.3	43.6	136	111.4	78.0	196	160.6	112.4	256	209.7	146.8
17	13.9	09.8	77	63.1	44.2	137	112.2	78.6	197	161.4	113.0	257	210.5	147.4
18	14.7	10.3	78	63.9	44.7	138	113.0	79.2	198	162.2	113.6	258	211.3	148.0
19	15.6	10.9	79	64.7	45.3	139	113.9	79.7	199	163.0	114.1	259	212.2	148.6
20	16.4	11.5	80	65.5	45.9	140	114.7	80.3	200	163.8	114.7	260	213.0	149.1
21	17.2	12.0	81	66.4	46.5	141	115.5	80.9	201	164.6	115.3	261	213.8	149.7
22	18.0	12.6	82	67.2	47.0	142	116.3	81.4	202	165.5	115.9	262	214.6	150.3
23	18.8	13.2	83	68.0	47.6	143	117.1	82.0	203	166.3	116.4	263	215.4	150.9
24	19.7	13.8	84	68.8	48.2	144	118.0	82.6	204	167.1	117.0	264	216.3	151.4
25	20.5	14.3	85	69.6	48.8	145	118.8	83.2	205	167.9	117.6	265	217.1	152.0
26	21.3	14.9	86	70.4	49.3	146	119.6	83.7	206	168.7	118.2	266	217.9	152.6
27	22.1	15.5	87	71.3	49.9	147	120.4	84.3	207	169.6	118.7	267	218.7	153.1
28	22.9	16.1	88	72.1	50.5	148	121.2	84.9	208	170.4	119.3	268	219.5	153.7
29	23.8	16.6	89	72.9	51.0	149	122.1	85.5	209	171.2	119.9	269	220.4	154.3
30	24.6	17.2	90	73.7	51.6	150	122.9	86.0	210	172.0	120.5	270	221.2	154.9
31	25 4	17.8	91	74.5	52.2	151	123.7	86.6	211	172.8	121.0	271	222.0	155.4
32	26.2	18.4	92	75.4	52.8	152	124.5	87.2	212	173.7	121.6	272	222.8	156.0
33	27.0	18.9	93	76.2	53.3	153	125.3	87.8	213	174.5	122.2	273	223.6	156.6
34	27.9	19.5	94	77.0	53.9	154	126.1	88.3	214	175.3	122.7	274	224.4	157.2
35	28.7	20.1	95	77.8	54.5	155	127.0	88.9	215	176.1	123.3	275	225.3	157.7
36	29.5	20.6	96	78.6	55.1	156	127.8	89.5	216	176.9	123.9	276	226.1	158.3
37	30.3	21.2	97	79.5	55.6	157	128.6	90.1	217	177.8	124.5	277	226.9	158.9
38	31.1	21.8	98	80.3	56.2	158	129.4	90.6	218	178.6	125.0	278	227.7	159.5
39	31.9	22.4	99	81.1	56.8	159	130.2	91.2	219	179.4	125.6	279	228.5	160.0
40	32.8	22.9	100	81.9	57.4	160	131.1	91.8	220	180.2	126.2	280	229.4	160.6
41	33.6	23.5	101	82.7	57.9	161	131.9	92.3	221	181.0	126.8	281	230.2	161.2
42	34.4	24.1	102	83.6	58.5	162	132.7	92.9	222	181.9	127.3	282	231.0	161.7
43	35.2	24.7	103	84.4	59.1	163	133.5	93.5	223	182.7	127.9	283	231.8	162.3
44	36.0	25.2	104	85.2	59.7	164	134.3	94.1	224	183.5	128.5	284	232.6	162.9
45	36.9	25.8	105	86.0	60.2	165	135.2	94.6	225	184.3	129.1	285	233.5	163.5
46	37.7	26.4	106	86.8	60.8	166	136.0	95.2	226	185.1	129.6	286	234.3	164.0
47	38.5	27.0	107	87.6	61.4	167	136.8	95.8	227	185.9	130.2	287	235.1	164.6
48	39.3	27.5	108	88.5	61.9	168	137.6	96.4	228	186.8	130.8	288	235.9	165.2
49	40.1	28.1	109	89.3	62.5	169	138.4	96.9	229	187.6	131.3	289	236.7	165.8
50	41.0	28.7	110	90.1	63.1	170	139.3	97.5	230	188.4	131.9	290	237.6	166.3
51	41.8	29.3	111	90.9	63.7	171	140.1	98.1	231	189.2	132.5	291	238.4	166 9
52	42.6	29.8	112	91.7	64.2	172	140.9	98.7	232	190.0	133.1	292	239.2	167.5
53	43.4	30.4	113	92.6	64.8	173	141.7	99.2	233	190.9	133.6	293	240.0	168.1
54	44.2	31.0	114	93.4	65.4	174	142.5	99.8	234	191.7	134.2	294	240.8	168.6
55	45.1	31.5	115	94.2	66.0	175	143.4	100.4	235	192.5	134.8	295	241.6	169.2
56	45.9	32.1	116	95.0	66.5	176	144.2	100.9	236	193.3	135.4	296	242.5	169.8
57	46.7	32.7	117	95.8	67.1	177	145.0	101.5	237	194.1	135.9	297	243.3	170.4
58	47.5	33.3	118	96.7	67.7	178	145.8	102.1	238	195.0	136.5	298	244.1	170.9
59	48.3	33 8	119	97.5	68.3	179	146.6	102.7	239	195.8	137.1	299	244.9	171.5
60	49.1	34.4	120	98.3	68.8	180	147.4	103.2	240	196.6	137.7	300	245.7	172.1
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 36 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	49.4	35.9	121	97.9	71.1	181	146.4	106.4	241	195.0	141.7
2	01.6	01.2	62	50.2	36.4	122	98.7	71.7	182	147.2	107.0	242	195.8	142.2
3	02.4	01.8	63	51.0	37.0	123	99.5	72.3	183	148.1	107.6	243	196.6	142.8
4	03.2	02.4	64	51.8	37.6	124	100.3	72.9	184	148.9	108.2	244	197.4	143.4
5	04.0	02.9	65	52.6	38.2	125	101.1	73.5	185	149.7	108.7	245	198.2	144.0
6	04.9	03.5	66	53.4	38.8	126	101.9	74.1	186	150.5	109.3	246	199.0	144.6
7	05.7	04.1	67	54.2	39.4	127	102.7	74.6	187	151.3	109.9	247	199.8	145.2
8	06.5	04.7	68	55.0	40.0	128	103.6	75.2	188	152.1	110.5	248	200 6	145.8
9	07.3	05.3	69	55.8	40.6	129	104.4	75.8	189	152.9	111.1	249	201 4	146.4
10	08.1	05.9	70	56.6	41.1	130	105.2	76.4	190	153.7	111.7	250	202.3	146.9
11	08.9	06.5	71	57.4	41.7	131	106.0	77.0	191	154.5	112.3	251	203.1	147.5
12	09.7	07.1	72	58.2	42.3	132	106.8	77.6	192	155.3	112.9	252	203.9	148.1
13	10.5	07 6	73	59.1	42.9	133	107.6	78.2	193	156.1	113.4	253	204.7	148.7
14	11.3	08.2	74	59.9	43.5	134	108.4	78.8	194	156.9	114.0	254	205.5	149.3
15	12.1	08.8	75	60.7	44.1	135	109.2	79.4	195	157.8	114.6	255	206.3	149.9
16	12.9	09.4	76	61.5	44.7	136	110.0	79.9	196	158.6	115.2	256	207.1	150.5
17	13.8	10.0	77	62.3	45.3	137	110.8	80.5	197	159.4	115.8	257	207.9	151.1
18	14.6	10.6	78	63.1	45.8	138	111.6	81.1	198	160.2	116.4	258	208.7	151.6
19	15.4	11.2	79	63.9	46.4	139	112.5	81.7	199	161.0	117.0	259	209.5	152.2
20	16.2	11.8	80	64.7	47.0	140	113.3	82.3	200	161.8	117.6	260	210.3	152.8
21	17.0	12.3	81	65.5	47.6	141	114.1	82.9	201	162.6	118.1	261	211.2	153.4
22	17.8	12.9	82	66.3	48.2	142	114.9	83.5	202	163.4	118.7	262	212.0	154.0
23	18.6	13.5	83	67.1	48.8	143	115.7	84.1	203	164.2	119.3	263	212.8	154.6
24	19.4	14.1	84	68.0	49.4	144	116.5	84.6	204	165.0	119.9	264	213.6	155.2
25	20.2	14.7	85	68.8	50.0	145	117.3	85.2	205	165.8	120.5	265	214.4	155.8
26	21.0	15.3	86	69.6	50.5	146	118.1	85.8	206	166.7	121.1	266	215.2	156.4
27	21.8	15.9	87	70.4	51.1	147	118.9	86.4	207	167.5	121.7	267	216.0	156.9
28	22.7	16.5	88	71.2	51.7	148	119.7	87.0	208	168.3	122.3	268	216.8	157.5
29	23.5	17.0	89	72.0	52.3	149	120.5	87.6	209	169.1	122.8	269	217.6	158.1
30	24.3	17.6	90	72.8	52.9	150	121.4	88.2	210	169.9	123 4	270	218.4	158.7
31	25.1	18.2	91	73.6	53.5	151	122.2	88.8	211	170.7	124.0	271	219.2	159.3
32	25.9	18.8	92	74.4	54.1	152	123.0	89.3	212	171.5	124.6	272	220.1	159.9
33	26.7	19.4	93	75.2	54.7	153	123.8	89.9	213	172.3	125.2	273	220.9	160.5
34	27.5	20.0	94	76.0	55.3	154	124.6	90.5	214	173.1	125.8	274	221.7	161.1
35	28.3	20.6	95	76.9	55.8	155	125.4	91.1	215	173.9	126.4	275	222.5	161.6
36	29.1	21.2	96	77.7	56.4	156	126.2	91.7	216	174.7	127.0	276	223.3	162.2
37	29.9	21.7	97	78.5	57.0	157	127.0	92.3	217	175.6	127.5	277	224.1	162.8
38	30.7	22.3	98	79.3	57.6	158	127.8	92.9	218	176.4	128.1	278	224.9	163.4
39	31.6	22.9	99	80.1	58.2	159	128.6	93.5	219	177.2	128.7	279	225.7	164.0
40	32.4	23.5	100	80.9	58.8	160	129.4	94.0	220	178.0	129.3	280	226.5	164.6
41	33.2	24.1	101	81.7	59.4	161	130.3	94.6	221	178.8	129.9	281	227.3	165.2
42	34.0	24.7	102	82.5	60.0	162	131.1	95.2	222	179.6	130.5	282	228.1	165.8
43	34.8	25.3	103	83.3	60.5	163	131.9	95.8	223	180.4	131.1	283	229.0	166.3
44	35.6	25.9	104	84.1	61.1	164	132.7	96.4	224	181.2	131.7	284	229.8	166.9
45	36.4	26.5	105	84.9	61.7	165	133.5	97.0	225	182.0	132.3	285	230.6	167.5
46	37.2	27.0	106	85.8	62.3	166	134.3	97.6	226	182.8	132.8	286	231.4	168.1
47	38.0	27.6	107	86.6	62.9	167	135.1	98.2	227	183.6	133.4	287	232.2	168.7
48	38.8	28.2	108	87.4	63.5	168	135.9	98.7	228	184.5	134.0	288	233.0	169.3
49	39.6	28.8	109	88.2	64.1	169	136.7	99.3	229	185.3	134.6	289	233.8	169.9
50	40.5	29.4	110	89.0	64.7	170	137.5	99.9	230	186.1	135.2	290	234.6	170.5
51	41.3	30.0	111	89.8	65.2	171	138.3	100.5	231	186.9	135.8	291	235.4	171.0
52	42.1	30.6	112	90.6	65.8	172	139.2	101.1	232	187.7	136.4	292	236.2	171.6
53	42.9	31.2	113	91.4	66.4	173	140.0	101.7	233	188.5	137.0	293	237.0	172.2
54	43.7	31.7	114	92.2	67.0	174	140.8	102.3	234	189.3	137.5	294	237.9	172.8
55	44.5	32.3	115	93.0	67.6	175	141.6	102.9	235	190.1	138.1	295	238.7	173.4
56	45.3	32.9	116	93.8	68.2	176	142.4	103.5	236	190.9	138.7	296	239.5	174.0
57	46.1	33.5	117	94.7	68.8	177	143.2	104.0	237	191.7	139.3	297	240.3	174.6
58	46.9	34.1	118	95.5	69.4	178	144.0	104.6	238	192.5	139.9	298	241.1	175.2
59	47.7	34.7	119	96.3	69.9	179	144.8	105.2	239	193.4	140.5	299	241.9	175.7
60	48.5	35.3	120	97.1	70.5	180	145.6	105.8	240	194.2	141.1	300	242.7	176.3
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 54 Degrees.

Difference of Latitude and Departure for 37 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	48.7	36.7	121	96.6	72.8	181	144.6	108.9	241	192.5	145.0
2	01.6	01.2	62	49.5	37.3	122	97.4	73.4	182	145.4	109.5	242	193.3	145.6
3	02.4	01.8	63	50.3	37.9	123	98.2	74.0	183	146.2	110.1	243	194.1	146.2
4	03.2	02.4	64	51.1	38.5	124	99.0	74.6	184	146.9	110.7	244	194.9	146.8
5	04.0	03.0	65	51.9	39.1	125	99.8	75.2	185	147.7	111.3	245	195.7	147.4
6	04.8	03.6	66	52.7	39.7	126	100.6	75.8	186	148.5	111.9	246	196.5	148.0
7	05.6	04.2	67	53.5	40.3	127	101.4	76.4	187	149.3	112.5	247	197.3	148.6
8	06.4	04.8	68	54.3	40.9	128	102.2	77.0	188	150.1	113.1	248	198.1	149.3
9	07.2	05.4	69	55.1	41.5	129	103.0	77.6	189	150.9	113.7	249	198.9	149.9
10	08.0	06.0	70	55.9	42.1	130	103.8	78.2	190	151.7	114.3	250	199.7	150.5
11	08.8	06.6	71	56.7	42.7	131	104.6	78.8	191	152.5	114.9	251	200 5	151.1
12	09.6	07.2	72	57.5	43.3	132	105.4	79.4	192	153.3	115.5	252	201.3	151.7
13	10.4	07.8	73	58.3	43.9	133	106.2	80.0	193	154.1	116.2	253	202.1	152.3
14	11.2	08.4	74	59.1	44.5	134	107.0	80.6	194	154.9	116.8	254	202.9	152.9
15	12.0	09.0	75	59.9	45.1	135	107.8	81.2	195	155.7	117.4	255	203.7	153.5
16	12.8	09.6	76	60.7	45.7	136	108.6	81.8	196	156.5	118.0	256	204.5	154.1
17	13.6	10.2	77	61.5	46.3	137	109.4	82.4	197	157.3	118.6	257	205.2	154.7
18	14.4	10.8	78	62.3	46.9	138	110.2	83.1	198	158.1	119.2	258	206.0	155.3
19	15.2	11.4	79	63.1	47.5	139	111.0	83.7	199	158.9	119.8	259	206.8	155.9
20	16.0	12.0	80	63.9	48.1	140	111.8	84.3	200	159.7	120.4	260	207.6	156.5
21	16.8	12.6	81	64.7	48.7	141	112.6	84.9	201	160.5	121.0	261	208.4	157.1
22	17.6	13.2	82	65.5	49.3	142	113.4	85.5	202	161.3	121.6	262	209.2	157.7
23	18.4	13.8	83	66.3	50.0	143	114.2	86.1	203	162.1	122.2	263	210.0	158.3
24	19.2	14.4	84	67.1	50.6	144	115.0	86.7	204	162.9	122.8	264	210.8	158.9
25	20.0	15.0	85	67.9	51.2	145	115.8	87.3	205	163.7	123.4	265	211.6	159.5
26	20.8	15.6	86	68.7	51.8	146	116.6	87.9	206	164.5	124.0	266	212.4	160.1
27	21.6	16.2	87	69.5	52.4	147	117.4	88.5	207	165.3	124.6	267	213.2	160.7
28	22.4	16.9	88	70.3	53.0	148	118.2	89.1	208	166.1	125.2	268	214.0	161.3
29	23.2	17.5	89	71.1	53.6	149	119.0	89.7	209	166.9	125.8	269	214.8	161.9
30	24.0	18.1	90	71.9	54.2	150	119.8	90.3	210	167.7	126.4	270	215.6	162.5
31	24.8	18.7	91	72.7	54.8	151	120.6	90.9	211	168.5	127.0	271	216.4	163.1
32	25.6	19.3	92	73.5	55.4	152	121.4	91.5	212	169.3	127.6	272	217.2	163.7
33	26.4	19.9	93	74.3	56.0	153	122.2	92.1	213	170.1	128.2	273	218.0	164.3
34	27.2	20.5	94	75.1	56.6	154	123.0	92.7	214	170.9	128.8	274	218.8	164.9
35	28.0	21.1	95	75.9	57.2	155	123.8	93.3	215	171.7	129.4	275	219.6	165.5
36	28.8	21.7	96	76.7	57.8	156	124.6	93.9	216	172.5	130.0	276	220.4	166.1
37	29.5	22.3	97	77.5	58.4	157	125.4	94.5	217	173.3	130.6	277	221.2	166.7
38	30.3	22.9	98	78.3	59.0	158	126.2	95.1	218	174.1	131.2	278	222.0	167.3
39	31.1	23.5	99	79.1	59.6	159	127.0	95.7	219	174.9	131.8	279	222.8	167.9
40	31.9	24.1	100	79.9	60.2	160	127.8	96.3	220	175.7	132.4	280	223.6	168.5
41	32.7	24.7	101	80.7	60.8	161	128.6	96.9	221	176.5	133.0	281	224.4	169.1
42	33.5	25.3	102	81.5	61.4	162	129.4	97.5	222	177.3	133.6	282	225.2	169.7
43	34.3	25.9	103	82.3	62.0	163	130.2	98.1	223	178.1	134.2	283	226.0	170.3
44	35.1	26.5	104	83.1	62.6	164	131.0	98.7	224	178.9	134.8	284	226.8	170.9
45	35.9	27.1	105	83.9	63.2	165	131.8	99.3	225	179.7	135.4	285	227.6	171.5
46	36.7	27.7	106	84.7	63.8	166	132.6	99.9	226	180.5	136.0	286	228.4	172.1
47	37.5	28.3	107	85.5	64.4	167	133.4	100.5	227	181.3	136.6	287	229.2	172.7
48	38.3	28.9	108	86.3	65.0	168	134.2	101.1	228	182.1	137.2	288	230.0	173.3
49	39.1	29.5	109	87.1	65.6	169	135.0	101.7	229	182.9	137.8	289	230.8	173.9
50	39.9	30.1	110	87.8	66.2	170	135.8	102.3	230	183.7	138.4	290	231.6	174.5
51	40.7	30 7	111	88.6	66.8	171	136.6	102.9	231	184.5	139.0	291	232.4	175.1
52	41.5	31.3	112	89.4	67.4	172	137.4	103.5	232	185.3	139.6	292	233.2	175.7
53	42.3	31.9	113	90.2	68.0	173	138.2	104.1	233	186.1	140.2	293	234.0	176.3
54	43.1	32.5	114	91.0	68.6	174	139.0	104.7	234	186.9	140.8	294	234.8	176.9
55	43.9	33.1	115	91.8	69.2	175	139.8	105.3	235	187.7	141.4	295	235.6	177.5
56	44.7	33.7	116	92.6	69.8	176	140.6	105.9	236	188.5	142.0	296	236.4	178.1
57	45.5	34.3	117	93.4	70.4	177	141.4	106.5	237	189.3	142.6	297	237.2	178.7
58	46.3	34.9	118	94.2	71.0	178	142.2	107.1	238	190.1	143.2	298	238.0	179.3
59	47.1	35.5	119	95.0	71.6	179	143.0	107.7	239	190.9	143.8	299	238.8	179.9
60	47.9	36.1	120	95.8	72.2	180	143.8	108.3	240	191.7	144.4	300	239.6	180.5
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 38 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	48.1	37.6	121	95.3	74.5	181	142.6	111.4	241	189.9	148.4
2	01.6	01.2	62	48.9	38.2	122	96.1	75.1	182	143.4	112.1	242	190.7	149.0
3	02.4	01.8	63	49.6	38.8	123	96.9	75.7	183	144.2	112.7	243	191.5	149.6
4	03.2	02.5	64	50.4	39.4	124	97.7	76.3	184	145.0	113.3	244	192.3	150.2
5	03.9	03.1	65	51.2	40.0	125	98.5	77.0	185	145.8	113.9	245	193.1	150.8
6	04.7	03.7	66	52.0	40.6	126	99.3	77.6	186	146.6	114.5	246	193.9	151.5
7	05.5	04.3	67	52.8	41.2	127	100.1	78.2	187	147.4	115.1	247	194.6	152.1
8	06.3	04.9	68	53.6	41.9	128	100.9	78.8	188	148.1	115.7	248	195.4	152.7
9	07.1	05.5	69	54.4	42.5	129	101.7	79.4	189	148.9	116.4	249	196.2	153.3
10	07.9	06.2	70	55.2	43.1	130	102.4	80.0	190	149.7	117.0	250	197.0	153.9
11	08.7	06.8	71	55.9	43.7	131	103.2	80.7	191	150.5	117.6	251	197.8	154.5
12	09.5	07.4	72	56.7	44.3	132	104.0	81.3	192	151.3	118.2	252	198.6	155.1
13	10.2	08.0	73	57.5	44.9	133	104.8	81.9	193	152.1	118.8	253	199.4	155.8
14	11.0	08.6	74	58.3	45.6	134	105.6	82.5	194	152.9	119.4	254	200.2	156.4
15	11.8	09.2	75	59.1	46.2	135	106.4	83.1	195	153.7	120.1	255	200.9	157.0
16	12.6	09.9	76	59.9	46.8	136	107.2	83.7	196	154.5	120.7	256	201.7	157.6
17	13.4	10.5	77	60.7	47.4	137	108.0	84.3	197	155.2	121.3	257	202.5	158.2
18	14.2	11.1	78	61.5	48.0	138	108.7	85.0	198	156.0	121.9	258	203.3	158.8
19	15.0	11.7	79	62.3	48.6	139	109.5	85.6	199	156.8	122.5	259	204.1	159.5
20	15.8	12.3	80	63.0	49.3	140	110.3	86.2	200	157.6	123.1	260	204.9	160.1
21	16.5	12.9	81	63.8	49.9	141	111.1	86.8	201	158.4	123.7	261	205.7	160.7
22	17.3	13.5	82	64.6	50.5	142	111.9	87.4	202	159.2	124.4	262	206.5	161.3
23	18.1	14.2	83	65.4	51.1	143	112.7	88.0	203	160.0	125.0	263	207.2	161.9
24	18.9	14.8	84	66.2	51.7	144	113.5	88.7	204	160.8	125.6	264	208.0	162.5
25	19.7	15.4	85	67.0	52.3	145	114.3	89.3	205	161.5	126.2	265	208.8	163.2
26	20.5	16.0	86	67.8	52.9	146	115.0	89.9	206	162.3	126.8	266	209.6	163.8
27	21.3	16.6	87	68.6	53.6	147	115.8	90.5	207	163.1	127.4	267	210.4	164.4
28	22.1	17.2	88	69.3	54.2	148	116.6	91.1	208	163.9	128.1	268	211.2	165.0
29	22.9	17.9	89	70.1	54.8	149	117.4	91.7	209	164.7	128.7	269	212.0	165.6
30	23.6	18.5	90	70.9	55.4	150	118.2	92.3	210	165.5	129.3	270	212.8	166.2
31	24.4	19.1	91	71.7	56.0	151	119.0	93.0	211	166.3	129.9	271	213.6	166.8
32	25.2	19.7	92	72.5	56.6	152	119.8	93.6	212	167.1	130.5	272	214.3	167.5
33	26.0	20.3	93	73.3	57.3	153	120.6	94.2	213	167.8	131.1	273	215.1	168.1
34	26.8	20.9	94	74.1	57.9	154	121.4	94.8	214	168.6	131.8	274	215.9	168.7
35	27.6	21.5	95	74.9	58.5	155	122.1	95.4	215	169.4	132.4	275	216.7	169.3
36	28.4	22.2	96	75.6	59.1	156	122.9	96.0	216	170.2	133.0	276	217.5	169.9
37	29.2	22.8	97	76.4	59.7	157	123.7	96.7	217	171.0	133.6	277	218.3	170.5
38	29.9	23.4	98	77.2	60.3	158	124.5	97.3	218	171.8	134.2	278	219.1	171.2
39	30.7	24.0	99	78.0	61.0	159	125.3	97.9	219	172.6	134.8	279	219.9	171.8
40	31.5	24.6	100	78.8	61.6	160	126.1	98.5	220	173.4	135.4	280	220.6	172.4
41	32.3	25.2	101	79.6	62.2	161	126.9	99.1	221	174.2	136.1	281	221.4	173.0
42	33.1	25.9	102	80.4	62.8	162	127.7	99.7	222	174.9	136.7	282	222.2	173.6
43	33.9	26.5	103	81.2	63.4	163	128.4	100.4	223	175.7	137.3	283	223.0	174.2
44	34.7	27.1	104	82.0	64.0	164	129.2	101.0	224	176.5	137.9	284	223.8	174.8
45	35.5	27.7	105	82.7	64.6	165	130.0	101.6	225	177.3	138.5	285	224.6	175.5
46	36.2	28.3	106	83.5	65.3	166	130.8	102.2	226	178.1	139.1	286	225.4	176.1
47	37.0	28.9	107	84.3	65.9	167	131.6	102.8	227	178.9	139.8	287	226.2	176.7
48	37.8	29.6	108	85.1	66.5	168	132.4	103.4	228	179.7	140.4	288	226.9	177.3
49	38.6	30.2	109	85.9	67.1	169	133.2	104.0	229	180.5	141.0	289	227.7	177.9
50	39.4	30.8	110	86.7	67.7	170	134.0	104.7	230	181.2	141.6	290	228.5	178.5
51	40.2	31.4	111	87.5	68.3	171	134.7	105.3	231	182.0	142.2	291	229.3	179.2
52	41.0	32.0	112	88.3	69.0	172	135.5	105.9	232	182.8	142.8	292	230.1	179.8
53	41.8	32.6	113	89.0	69.6	173	136.3	106.5	233	183.6	143.4	293	230.9	180.4
54	42.6	33.2	114	89.8	70.2	174	137.1	107.1	234	184.4	144.1	294	231.7	181.0
55	43.3	33.9	115	90.6	70.8	175	137.9	107.7	235	185.2	144.7	295	232.5	181.6
56	44.1	34.5	116	91.4	71.4	176	138.7	108.4	236	186.0	145.3	296	233.3	182.2
57	44.9	35.1	117	92.2	72.0	177	139.5	109.0	237	186.8	145.9	297	234.0	182.9
58	45.7	35.7	118	93.0	72.6	178	140.3	109.6	238	187.5	146.5	298	234.8	183.5
59	46.5	36.3	119	93.8	73.3	179	141.1	110.2	239	188.3	147.1	299	235.6	184.1
60	47.3	36.9	120	94.6	73.9	180	141.8	110.8	240	189.1	147.8	300	236.4	184.7
/Dist	Dep.	Lat	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Difference of Latitude and Departure for 39 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	47.4	38.4	121	94.0	76.1	181	140.7	113.9	241	187.3	151.7
2	01.6	01.3	62	48.2	39.0	122	94.8	76.8	182	141.4	114.5	242	188.1	152.3
3	02.3	01.9	63	49.0	39.6	123	95.6	77.4	183	142.2	115.2	243	188.8	152.9
4	03.1	02 5	64	49.7	40.3	124	96 4	78.0	184	143.0	115.8	244	189.6	153.6
5	03.9	03..	65	50.5	40.9	125	97 1	78.7	185	143.8	116.4	245	190.4	154.2
6	04.7	03.8	66	51.3	41.5	126	97.9	79.3	186	144.5	117.1	246	191.2	154.8
7	05.4	04.4	67	52.1	42.2	127	98.7	79.9	187	145.3	117.7	247	192.0	155.4
8	06.2	05.0	68	52.8	42.8	128	99.5	80.6	188	146.1	118.3	248	192.7	156.1
9	07.0	05.7	69	53.6	43.4	129	100.3	81.2	189	146.9	118.9	249	193.5	156.7
10	07.8	06.3	70	54.4	44.1	130	101.0	81.8	190	147.7	119.6	250	194.3	157.3
11	08.5	06.9	71	55.2	44.7	131	101.8	82.4	191	148.4	120.2	251	195.1	158.0
12	09.3	07.6	72	56.0	45.3	132	102.6	83.1	192	149.2	120.8	252	195.8	158.6
13	10.1	08.2	73	56.7	45.9	133	103.4	83.7	193	150.0	121.5	253	196.6	159.2
14	10.9	08.8	74	57.5	46.6	134	104.1	84.3	194	150.8	122.1	254	197.4	159.8
15	11.7	09.4	75	58.3	47.2	135	104.9	85.0	195	151.5	122.7	255	198.2	160.5
16	12.4	10.1	76	59.1	47.8	136	105.7	85.6	196	152.3	123.3	256	198.9	161.1
17	13.2	10.7	77	59.8	48.5	137	106.5	86.2	197	153.1	124.0	257	199.7	161.7
18	14.0	11.3	78	60.6	49.1	138	107.2	86.8	198	153.9	124.6	258	200.5	162.4
19	14.8	12.0	79	61.4	49.7	139	108.0	87.5	199	154.7	125.2	259	201.3	163.0
20	15.5	12.6	80	62.2	50.3	140	108.8	88.1	200	155.4	125.9	260	202.1	163.6
21	16.3	13.2	81	62.9	51.0	141	109.6	88.7	201	156.2	126.5	261	202.8	164.3
22	17.1	13.8	82	63.7	51.6	142	110.4	89.4	202	157.0	127.1	262	203.6	164.9
23	17.9	14.5	83	64.5	52.2	143	111.1	90.0	203	157.8	127.8	263	204.4	165.5
24	18.7	15.1	84	65.3	52.9	144	111.9	90.6	204	158.5	128.4	264	205.2	166.1
25	19.4	15.7	85	66.1	53.5	145	112.7	91.3	205	159.3	129.0	265	205.9	166.8
26	20.2	16 4	86	66.8	54.1	146	113.5	91.9	206	160.1	129.6	266	206.7	167.4
27	21.0	17.0	87	67.6	54.8	147	114.2	92.5	207	160.9	130.3	267	207.5	168.0
28	21.8	17.6	88	68.4	55.4	148	115.0	93.1	208	161.6	130.9	268	208.3	168.7
29	22.5	18.3	89	69.2	56.0	149	115.8	93.8	209	162.4	131.5	269	209.1	169.3
30	23.3	18.9	90	69.9	56.6	150	116.6	94.4	210	163.2	132.2	270	209.8	169.9
31	24.1	19.5	91	70.7	57.3	151	117.3	95.0	211	164.0	132.8	271	210.6	170.5
32	24.9	20.1	92	71.5	57.9	152	118.1	95.7	212	164.8	133.4	272	211.4	171.2
33	25.6	20.8	93	72.3	58.5	153	118.9	96.3	213	165.5	134.0	273	212.2	171.8
34	26.4	21.4	94	73.1	59.2	154	119.7	96.9	214	166.3	134.7	274	212.9	172.4
35	27.2	22.0	95	73.8	59.8	155	120.5	97.5	215	167.1	135.3	275	213.7	173.1
36	28.0	22.7	96	74.6	60.4	156	121.2	98.2	216	167.9	135.9	276	214.5	173.7
37	28.8	23.3	97	75.4	61.0	157	122.0	98.8	217	168.6	136.6	277	215.3	174.3
38	29.5	23.9	98	76.2	61.7	158	122.8	99.4	218	169.4	137.2	278	216.0	175.0
39	30.3	24.5	99	76.9	62.3	159	123.6	100.1	219	170.2	137.8	279	216.8	175.6
40	31.1	25.2	100	77.7	62.9	160	124.3	100.7	220	171.0	138.5	280	217.6	176.2
41	31.9	25.8	101	78.5	63.6	161	125.1	101.3	221	171.7	139.1	281	218.4	176.8
42	32.6	26.4	102	79.3	64.2	162	125.9	101.9	222	172.5	139.7	282	219.2	177.5
43	33.4	27.1	103	80.0	64.8	163	126.7	102.6	223	173.3	140.3	283	219.9	178.1
44	34.2	27.7	104	80.8	65.4	164	127.5	103.2	224	174.1	141.0	284	220.7	178.7
45	35.0	28.3	105	81.6	66.1	165	128.2	103.8	225	174.9	141.6	285	221.5	179.4
46	35.7	28.9	106	82.4	66.7	166	129.0	104.5	226	175.6	142.2	286	222.3	180.0
47	36.5	29.6	107	83.2	67.3	167	129.8	105.1	227	176.4	142.9	287	223.0	180.6
48	37.3	30.2	108	83.9	68.0	168	130.6	105.7	228	177.2	143.5	288	223.8	181 2
49	38.1	30.8	109	84.7	68.6	169	131.3	106.4	229	178.0	144.1	289	224.6	181.9
50	38.9	31.5	110	85.5	69.2	170	132.1	107.0	230	178.7	144.7	290	225.4	182.5
51	39.6	32.1	111	86.3	69.9	171	132.9	107.6	231	179.5	145.4	291	226.1	183.1
52	40.4	32.7	112	87.0	70.5	172	133.7	108.2	232	180.3	146.0	292	226.9	183.8
53	41.2	33.4	113	87.8	71.1	173	134.4	108.9	233	181.1	146.6	293	227.7	184.4
54	42.0	34.0	114	88.6	71.7	174	135.2	109.5	234	181.9	147.3	294	228.5	185.0
55	42.7	34.6	115	89.4	72.4	175	136.0	110.1	235	182.6	147.9	295	229.3	185.6
56	43.5	35.2	116	90.1	73.0	176	136.8	110.8	236	183.4	148.5	296	230.0	186.3
57	44.3	35.9	117	90.9	73.6	177	137.6	111.4	237	184.2	149.1	297	230.8	186.9
58	45.1	36.5	118	91.7	74.3	178	138.3	112 0	238	185.0	149.8	298	231.6	187.5
59	45.9	37.1	119	92.5	74.9	179	139.1	112.6	239	185.7	150.4	299	232.4	188.2
60	46.6	37.8	120	93.3	75.5	180	139.9	113.3	240	186.5	151.0	300	233.1	188.8
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 40 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	46.7	39.2	121	92.7	77.8	181	138.7	116.3	241	184.6	154.9
2	01.5	01.3	62	47.5	39.9	122	93.5	78.4	182	139.4	117.0	242	185.4	155.6
3	02.3	01.9	63	48.3	40.5	123	94.2	79.1	183	140.2	117.6	243	186.1	156.2
4	03.1	02.6	64	49.0	41.1	124	95.0	79.7	184	141.0	118.3	244	186.9	156.8
5	03.8	03.2	65	49.8	41.8	125	95.8	80.3	185	141.7	118.9	245	187.7	157.5
6	04.6	03.9	66	50.6	42.4	126	96.5	81.0	186	142.5	119.6	246	188.4	158.1
7	05.4	04.5	67	51.3	43.1	127	97.3	81.6	187	143.3	120.2	247	189.2	158.8
8	06.1	05.1	68	52.1	43.7	128	98.1	82.3	188	144.0	120.8	248	190.0	159.4
9	06.9	05.8	69	52.9	44.4	129	98.8	82.9	189	144.8	121.5	249	190.7	160.1
10	07.7	06.4	70	53.6	45.0	130	99.6	83.6	190	145.5	122.1	250	191.5	160.7
11	08.4	07.1	71	54.4	45.6	131	100.4	84.2	191	146.3	122.8	251	192.3	161.3
12	09.2	07.7	72	55.2	46.3	132	101.1	84.8	192	147.1	123.4	252	193.0	162.0
13	10.0	08.4	73	55.9	46.9	133	101.9	85.5	193	147.8	124.1	253	193.8	162.6
14	10.7	09.0	74	56.7	47.6	134	102.6	86.1	194	148.6	124.7	254	194.6	163.3
15	11.5	09.6	75	57.5	48.2	135	103.4	86.8	195	149.4	125.3	255	195.3	163.9
16	12.3	10.3	76	58.2	48.9	136	104.2	87.4	196	150.1	126.0	256	196.1	164.6
17	13.0	10.9	77	59.0	49.5	137	104.9	88.1	197	150.9	126.6	257	196.9	165.2
18	13.8	11.6	78	59.8	50.1	138	105.7	88.7	198	151.7	127.3	258	197.6	165.8
19	14.6	12.2	79	60.5	50.8	139	106.5	89.3	199	152.4	127.9	259	198.4	166.5
20	15.3	12.9	80	61.3	51.4	140	107.2	90.0	200	153.2	128.6	260	199.2	167.1
21	16.1	13.5	81	62.0	52.1	141	108.0	90.6	201	154.0	129.2	261	199.9	167.8
22	16.9	14.1	82	62.8	52.7	142	108.8	91.3	202	154.7	129.8	262	200.7	168.4
23	17.6	14.8	83	63.6	53.4	143	109.5	91.9	203	155.5	130.5	263	201.5	169.1
24	18.4	15.4	84	64.3	54.0	144	110.3	92.6	204	156.3	131.1	264	202.2	169.7
25	19.2	16.1	85	65.1	54.6	145	111.1	93.2	205	157.0	131.8	265	203.0	170.3
26	19.9	16.7	86	65.9	55.3	146	111.8	93.8	206	157.8	132.4	266	203.8	171.0
27	20.7	17.4	87	66.6	55.9	147	112.6	94.5	207	158.6	133.1	267	204.5	171.6
28	21.4	18.0	88	67.4	56.6	148	113.4	95.1	208	159.3	133.7	268	205.3	172.3
29	22.2	18.6	89	68.2	57.2	149	114.1	95.8	209	160.1	134.3	269	206.1	172.9
30	23.0	19.3	90	68.9	57.9	150	114.9	96.4	210	160.9	135.0	270	206.8	173.6
31	23.7	19.9	91	69.7	58.5	151	115.7	97.1	211	161.6	135.6	271	207.6	174.2
32	24.5	20.6	92	70.5	59.1	152	116.4	97.7	212	162.4	136.3	272	208.4	174.8
33	25.3	21.2	93	71.2	59.8	153	117.2	98.3	213	163.2	136.9	273	209.1	175.5
34	26.0	21.9	94	72.0	60.4	154	118.0	99.0	214	163.9	137.6	274	209.9	176.1
35	26.8	22.5	95	72.8	61 1	155	118.7	99.6	215	164.7	138.2	275	210.7	176.8
36	27.6	23.1	96	73.5	61.7	156	119.5	100.3	216	165.5	138.8	276	211.4	177.4
37	28.3	23.8	97	74.3	62.4	157	120.3	100.9	217	166.2	139.5	277	212.2	178.1
38	29.1	24.4	98	75.1	63.0	158	121.0	101.6	218	167.0	140.1	278	213.0	178.7
39	29.9	25.1	99	75.8	63.6	159	121.8	102.2	219	167.8	140.8	279	213.7	179.3
40	30.6	25.7	100	76.6	64.3	160	122.6	102.8	220	168.5	141.4	280	214.5	180.0
41	31.4	26.4	101	77.4	64.9	161	123.3	103.5	221	169.3	142.1	281	215.3	180.6
42	32.2	27.0	102	78.1	65.6	162	124.1	104.1	222	170.1	142.7	282	216.0	181.3
43	32.9	27.6	103	78.9	66.2	163	124.9	104.8	223	170.8	143.3	283	216.8	181.9
44	33.7	28.3	104	79.7	66.8	164	125.6	105.4	224	171.6	144.0	284	217.6	182.6
45	34.5	28.9	105	80.4	67.5	165	126.4	106.1	225	172.4	144.6	285	218.3	183.2
46	35.2	29.6	106	81.2	68.1	166	127.2	106.7	226	173.1	145.3	286	219.1	183.8
47	36 0	30.2	107	82.0	68.8	167	127.9	107.3	227	173.9	145.9	287	219.9	184.5
48	36.8	30.9	108	82.7	69.4	168	128.7	108.0	228	174.7	146.6	288	220.6	185.1
49	37.5	31.5	109	83.5	70.1	169	129.5	108.6	229	175.4	147.2	289	221.4	185.8
50	38.3	32.1	110	84.3	70.7	170	130.2	109.3	230	176.2	147.8	290	222.2	186.4
51	39.1	32.8	111	85.0	71.3	171	131.0	109.9	231	177.0	148.5	291	222.9	187.1
52	39.8	33.4	112	85.8	72.0	172	131.8	110.6	232	177.7	149.1	292	223.7	187.7
53	40.6	34.1	113	86.6	72.6	173	132.5	111.2	233	178.5	149.8	293	224.5	188.3
54	41.4	34.7	114	87.3	73.3	174	133.3	111.8	234	179.3	150.4	294	225.2	189.0
55	42.1	35.4	115	88.1	73.9	175	134.1	112.5	235	180.0	151.1	295	226.0	189.6
56	42.9	36.0	116	88.9	74.6	176	134.8	113.1	236	180.8	151.7	296	226.7	190.3
57	43.7	36.6	117	89.6	75.2	177	135.6	113.8	237	181.6	152.3	297	227.5	190.9
58	44.4	37.3	118	90.4	75.8	178	136.4	114.4	238	182.3	153.0	298	228.3	191.6
59	45.2	37.9	119	91.2	76.5	179	137.1	115.1	239	183.1	153.6	299	229.0	192.2
60	46.0	38.6	120	91.9	77.1	180	137.9	115.7	240	183.9	154.3	300	229.8	192.8
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 50 Degrees.

TABLE II.

Difference of Latitude and Departure for 41 Degrees.

Dist	Lat	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.7	61	46.0	40.0	121	91.3	79.4	181	136.6	118.7	241	181.9	158.1
2	01.5	01.3	62	46.8	40.7	122	92.1	80.0	182	137.4	119.4	242	182.6	158.8
3	02.3	02.0	63	47.5	41.3	123	92.8	80.7	183	138.1	120.1	243	183.4	159.4
4	03.0	02.6	64	48.3	42.0	124	93.6	81.4	184	138.9	120.7	244	184.1	160.1
5	03.8	03.3	65	49.1	42.6	125	94.3	82.0	185	139.6	121.4	245	184.9	160.7
6	04.5	03.9	66	49.8	43.3	126	95.1	82.7	186	140.4	122.0	246	185.7	161.4
7	05.3	04.6	67	50.6	44.0	127	95.8	83.3	187	141.1	122.7	247	186.4	162.0
8	06.0	05.2	68	51.3	44.6	128	96.6	84.0	188	141.9	123.3	248	187.2	162.7
9	06.8	05.9	69	52.1	45.3	129	97.4	84.6	189	142.6	124.0	249	187.9	163.4
10	07.5	06.6	70	52.8	45.9	130	98.1	85.3	190	143.4	124.7	250	188.7	164.0
11	08.3	07.2	71	53.6	46.6	131	98.9	85.9	191	144.1	125.3	251	189.4	164.7
12	09.1	07.9	72	54.3	47.2	132	99.6	86.6	192	144.9	126.0	252	190.2	165.3
13	09.8	08.5	73	55.1	47.9	133	100.4	87.3	193	145.7	126.6	253	190.9	166.0
14	10.6	09.2	74	55.8	48.5	134	101.1	87.9	194	146.4	127.3	254	191.7	166.6
15	11.3	09.8	75	56.6	49.2	135	101.9	88.6	195	147.2	127.9	255	192.5	167.3
16	12.1	10.5	76	57.4	49.9	136	102.6	89.2	196	147.9	128.6	256	193.2	168.0
17	12.8	11.2	77	58.1	50.5	137	103.4	89.9	197	148.7	129.2	257	194.0	168.6
18	13.6	11.8	78	58.9	51.2	138	104.1	90.5	198	149.4	129.9	258	194.7	169.3
19	14.3	12.5	79	59.6	51.8	139	104.9	91.2	199	150.2	130.6	259	195.5	169.9
20	15.1	13.1	80	60.4	52.5	140	105.7	91.8	200	150.9	131.2	260	196.2	170.6
21	15.8	13.8	81	61.1	53.1	141	106.4	92.5	201	151.7	131.9	261	197.0	171.2
22	16.6	14.4	82	61.9	53.8	142	107.2	93.2	202	152.5	132.5	262	197.7	171.9
23	17.4	15.1	83	62.6	54.5	143	107.9	93.8	203	153.2	133.2	263	198.5	172.5
24	18.1	15.7	84	63.4	55.1	144	108.7	94.5	204	154.0	133.8	264	199.2	173.2
25	18.9	16.4	85	64.2	55.8	145	109.4	95.1	205	154.7	134.5	265	200.0	173.9
26	19.6	17.1	86	64.9	56.4	146	110.2	95.8	206	155.5	135.1	266	200.8	174.5
27	20.4	17.7	87	65.7	57.1	147	110.9	96.4	207	156.2	135.8	267	201.5	175.2
28	21.1	18.4	88	66.4	57.7	148	111.7	97.1	208	157.0	136.5	268	202.3	175.8
29	21.9	19.0	89	67.2	58.4	149	112.5	97.8	209	157.7	137.1	269	203.0	176.5
30	22.6	19.7	90	67.9	59.0	150	113.2	98.4	210	158.5	137.8	270	203.8	177.1
31	23.4	20.3	91	68.7	59.7	151	114.0	99.1	211	159.2	138.4	271	204.5	177.8
32	24.2	21.0	92	69.4	60.4	152	114.7	99.7	212	160.0	139.1	272	205.3	178.4
33	24.9	21.6	93	70.2	61.0	153	115.5	100.4	213	160.8	139.7	273	206.0	179.1
34	25.7	22.3	94	70.9	61.7	154	116.2	101.0	214	161.5	140.4	274	206.8	179.8
35	26.4	23.0	95	71.7	62.3	155	117.0	101.7	215	162.3	141.1	275	207.5	180.4
36	27.2	23.6	96	72.5	63.0	156	117.7	102.3	216	163.0	141.7	276	208.3	181.1
37	27.9	24.3	97	73.2	63.6	157	118.5	103.0	217	163.8	142.4	277	209.1	181.7
38	28.7	24.9	98	74.0	64.3	158	119.2	103.7	218	164.5	143.0	278	209.8	182.4
39	29.4	25.6	99	74.7	64.9	159	120.0	104.3	219	165.3	143.7	279	210.6	183.0
40	30.2	26.2	100	75.5	65.6	160	120.8	105.0	220	166.0	144.3	280	211.3	183.7
41	30.9	26.9	101	76.2	66.3	161	121.5	105.6	221	166.8	145.0	281	212.1	184.4
42	31.7	27.6	102	77.0	66.9	162	122.3	106.3	222	167.5	145.6	282	212.8	185.0
43	32.5	28.2	103	77.7	67.6	163	123.0	106.9	223	168.3	146.3	283	213.6	185.7
44	33.2	28.9	104	78.5	68.2	164	123.8	107.6	224	169.1	147.0	284	214.3	186.3
45	34.0	29.5	105	79.2	68.9	165	124.5	108.2	225	169.8	147.6	285	215.1	187.0
46	34.7	30.2	106	80.0	69.5	166	125.3	108.9	226	170.6	148.3	286	215.8	187.6
47	35.5	30.8	107	80.8	70.2	167	126.0	109.6	227	171.3	148.9	287	216.6	188.3
48	36.2	31.5	108	81.5	70.9	168	126.8	110.2	228	172.1	149.6	288	217.4	188.9
49	37.0	32.1	109	82.3	71.5	169	127.5	110.9	229	172.8	150.2	289	218.1	189.6
50	37.7	32.8	110	83.0	72.2	170	128.3	111.5	230	173.6	150.9	290	218.9	190.3
51	38.5	33.5	111	83.8	72.8	171	129.1	112.2	231	174.3	151.5	291	219.6	190.9
52	39.2	34.1	112	84.5	73.5	172	129.8	112.8	232	175.1	152.2	292	220.4	191.6
53	40.0	34.8	113	85.3	74.1	173	130.6	113.5	233	175.8	152.9	293	221.1	192.2
54	40.8	35.4	114	86.0	74.8	174	131.3	114.2	234	176.6	153.5	294	221.9	192.9
55	41.5	36.1	115	86.8	75.4	175	132.1	114.8	235	177.4	154.2	295	222.6	193.5
56	42.3	36.7	116	87.5	76.1	176	132.8	115.5	236	178.1	154.8	296	223.4	194.2
57	43.0	37.4	117	88.3	76.8	177	133.6	116.1	237	178.9	155.5	297	224.1	194.8
58	43.8	38.1	118	89.1	77.4	178	134.3	116.8	238	179.6	156.1	298	224.9	195.5
59	44.5	38.7	119	89.8	78.1	179	135.1	117.4	239	180.4	156.8	299	225.7	196.2
60	45.3	39.4	120	90.6	78.7	180	135.8	118.1	240	181.1	157.5	300	226.4	196.8
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 42 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	45.3	40.8	121	89.9	81.0	181	134.5	121.1	241	179.1	161.3
2	01.5	01.3	62	46.1	41.5	122	90.7	81.6	182	135.3	121.8	242	179.8	161.9
3	02.2	02.0	63	46.8	42.2	123	91.4	82.3	183	136.0	122.5	243	180.6	162.6
4	03.0	02.7	64	47.6	42.8	124	92.1	83.0	184	136.7	123.1	244	181.3	163.3
5	03.7	03.3	65	48.3	43.5	125	92.9	83.6	185	137.5	123.8	245	182.1	163.9
6	04.5	04.0	66	49.0	44.2	126	93.6	84.3	186	138.2	124.5	246	182 8	164.6
7	05.2	04.7	67	49.8	44.8	127	94.4	85.0	187	139.0	125.1	247	183.6	165.3
8	05.9	05.4	68	50.5	45.5	128	95.1	85.6	188	139.7	125.8	248	184.3	165.9
9	06.7	06 0	69	51.3	46.2	129	95.9	86.3	189	140.5	126.5	249	185.0	166.6
10	07.4	06.7	70	52.0	46.8	130	96.6	87.0	190	141.2	127.1	250	185.8	167.3
11	08.2	07.4	71	52.8	47.5	131	97.4	87.7	191	141.9	127.8	251	186.5	168.0
12	08.9	08.0	72	53.5	48.2	132	98.1	88.3	192	142.7	128.5	252	187.3	168.6
13	09.7	08.7	73	54.2	48.8	133	98.8	89.0	193	143.4	129.1	253	188.0	169.3
14	10.4	09.4	74	55.0	49.5	134	99.6	89.7	194	144.2	129.8	254	188.8	170.0
15	11.1	10.0	75	55.7	50.2	135	100.3	90.3	195	144.9	130.5	255	189.5	170.6
16	11.9	10.7	76	56.5	50.9	136	101.1	91.0	196	145.7	131.1	256	190.2	171.3
17	12.6	11.4	77	57.2	51.5	137	101.8	91.7	197	146.4	131.8	257	191.0	172.0
18	13.4	12.0	78	58.0	52.2	138	102.6	92.3	198	147.1	132.5	258	191.7	172.6
19	14.1	12.7	79	58.7	52.9	139	103.3	93.0	199	147.9	133.2	259	192.5	173.3
20	14.9	13.4	80	59.5	53.5	140	104.0	93.7	200	148.6	133.8	260	193.2	174.0
21	15.0	14.1	81	60.2	54.2	141	104.8	94.3	201	149.4	134.5	261	194.0	174.6
22	16.3	14.7	82	60.9	54.9	142	105.5	95.0	202	150.1	135.2	262	194.7	175.3
23	17.1	15.4	83	61.7	55.5	143	106.3	95.7	203	150.9	135.8	263	195.4	176.0
24	17.8	16.1	84	62.4	56.2	144	107.0	96.4	204	151.6	136.5	264	196.2	176.7
25	18.6	16.7	85	63.2	56.9	145	107.8	97.0	205	152.3	137.2	265	196.9	177.3
26	19.3	17.4	86	63.9	57.5	146	108.5	97.7	206	153.1	137.8	266	197.7	178.0
27	20.1	18.1	87	64.7	58.2	147	109.2	98.4	207	153.8	138.5	267	198.4	178.7
28	20.8	18.7	88	65.4	58.9	148	110.0	99.0	208	154.6	139.2	268	199.2	179.3
29	21.6	19.4	89	66.1	59.6	149	110.7	99.7	209	155.3	139.8	269	199.9	180.0
30	22.3	20.1	90	66.9	60.2	150	111.5	100.4	210	156.1	140.5	270	200.6	180.7
31	23.0	20.7	91	67.6	60.9	151	112.2	101.0	211	156.8	141.2	271	201.4	181.3
32	23.8	21.4	92	68.4	61.6	152	113.0	101.7	212	157.5	141.9	272	202.1	182.0
33	24.5	22.1	93	69.1	62.2	153	113.7	102.4	213	158.3	142.5	273	202.9	182.7
34	25.3	22.8	94	69.9	62.9	154	114.4	103.0	214	159.0	143.2	274	203.6	183.3
35	26.0	23.4	95	70.6	63.6	155	115.2	103.7	215	159.8	143.9	275	204.4	184.0
36	26.8	24.1	96	71.3	64.2	156	115.9	104.4	216	160.5	144.5	276	205.1	184.7
37	27.5	24.8	97	72.1	64.9	157	116.7	105.1	217	161.3	145.2	277	205.9	185.3
38	28.2	25.4	98	72.8	65.6	158	117.4	105.7	218	162.0	145.9	278	206.6	186.0
39	29.0	26.1	99	73.6	66.2	159	118.2	106.4	219	162.7	146.5	279	207.3	186.7
40	29.7	26.8	100	74.3	66.9	160	118.9	107.1	220	163.5	147.2	280	208.1	187.4
41	30.5	27.4	101	75.1	67.6	161	119.6	107.7	221	164.2	147.9	281	208.8	188.0
42	31.2	28.1	102	75.8	68.3	162	120.4	108.4	222	165.0	148.5	282	209.6	188.7
43	32.0	28.8	103	76.5	68.9	163	121.1	109.1	223	165.7	149.2	283	210.3	189.4
44	32.7	29.4	104	77.3	69.6	164	121.9	109.7	224	166.5	149.9	284	211.1	190.0
45	33.4	30.1	105	78.0	70.3	165	122.6	110.4	225	167.2	150.6	285	211.8	190.7
46	34.2	30.8	106	78.8	70.9	166	123.4	111.1	226	168.0	151.2	286	212.5	191.4
47	34.9	31.4	107	79.5	71.6	167	124.1	111.7	227	168.7	151.9	287	213.3	192.0
48	35.7	32.1	108	80.3	72.3	168	124.8	112.4	228	169.4	152.6	288	214.0	192.7
49	36.4	32.8	109	81.0	72.9	169	125.6	113.1	229	170.2	153.2	289	214.8	193.4
50	37.2	33.5	110	81.7	73.6	170	126.3	113.8	230	170.9	153.9	290	215.5	194.0
51	37.9	34.1	111	82.5	74.3	171	127.1	114.4	231	171.7	154.6	291	216.3	194.7
52	38.6	34.8	112	83.2	74.9	172	127.8	115.1	232	172.4	155.2	292	217.0	195.4
53	39.4	35.5	113	84.0	75.6	173	128.6	115.8	233	173.2	155.9	293	217.7	196.1
54	40.1	36.1	114	84.7	76.3	174	129.3	116.4	234	173.9	156.6	294	218.5	196.7
55	40.9	36.8	115	85.5	77.0	175	130.1	117.1	235	174.6	157.2	295	219.2	197.4
56	41.6	37.5	116	86.2	77.6	176	130.8	117.8	236	175.4	157.9	296	220.0	198.1
57	42.4	38.1	117	86.9	78.3	177	131.5	118.4	237	176.1	158.6	297	220.7	198.7
58	43.1	38.8	118	87.7	79.0	178	132.3	119.1	238	176.9	159.3	298	221.5	199.4
59	43.8	39.5	119	88.4	79.6	179	133.0	119.8	239	177.6	159.9	299	222.2	200.1
60	44.6	40.1	120	89.2	80.3	180	133.8	120.4	240	178.4	160.6	300	222.9	200.7
Dist	*Dep.*	*Lat.*	*Dist*	*Dep.*	*Lat.*	*Dist*	*Dep.*	*Lat.*	*Dist*	*Dep.*	*Lat.*	*Dist*	*Dep*	*Lat.*

Difference of Latitude and Departure for 43 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	44.6	41.6	121	88.5	82.5	181	132.4	123.4	241	176.3	164.4
2	01.5	01.4	62	45.3	42.3	122	89.2	83.2	182	133.1	124.1	242	177.0	165.0
3	02.2	02.0	63	46.1	43.0	123	90.0	83.9	183	133.8	124.8	243	177.7	165.7
4	02.9	02.7	64	46.8	43.6	124	90.7	84.6	184	134.6	125.5	244	178.5	166.4
5	03.7	03.4	65	47.5	44.3	125	91 4	85.2	185	135.3	126.2	245	179.2	167.1
6	04.4	04.1	66	48.3	45.0	126	92.2	85.9	186	136.0	126.9	246	179.9	167.8
7	05.1	04.8	67	49.0	45.7	127	92.9	86.6	187	136.8	127.5	247	180.6	168.5
8	05.9	05.5	68	49.7	46.4	128	93.6	87.3	188	137.5	128.2	248	181.4	169.1
9	06.6	06.1	69	50.5	47.1	129	94.3	88.0	189	138.2	128.9	249	182.1	169.8
10	07.3	06.8	70	51.2	47.7	130	95.1	88.7	190	139.0	129.6	250	182.8	170.5
11	08.0	07.5	71	51.9	48.4	131	95.8	89.3	191	139.7	130.3	251	183.6	171.2
12	08 8	08.2	72	52.7	49.1	132	96.5	90.0	192	140.4	130.9	252	184.3	171.9
13	09.5	08.9	73	53.4	49.8	133	97.3	90.7	193	141.2	131.6	253	185.0	172.5
14	10.2	09.5	74	54.1	50.5	134	98.0	91.4	194	141.9	132.3	254	185.8	173.2
15	11.0	10.2	75	54.9	51.1	135	98.7	92.1	195	142.6	133.0	255	186.5	173.9
16	11.7	10.9	76	55.6	51.8	136	99.5	92.8	196	143.3	133.7	256	187.2	174.6
17	12.4	11.6	77	56.3	52.5	137	100.2	93.4	197	144.1	134.4	257	188.0	175.3
18	13.2	12.3	78	57.0	53.2	138	100.9	94.1	198	144.8	135.0	258	188.7	176.0
19	13.9	13.0	79	57.8	53.9	139	101.7	94.8	199	145.5	135.7	259	189.4	176.6
20	14.6	13.6	80	58.5	54.6	140	102.4	95.5	200	146.3	136.4	260	190.2	177.3
21	15.4	14.3	81	59.2	55.2	141	103.1	96.2	201	147.0	137.1	261	190.9	178.0
22	16.1	15.0	82	60.0	55.9	142	103.9	96.8	202	147.7	137.8	262	191.6	178.7
23	16.8	15.7	83	60.7	56.6	143	104.6	97.5	203	148.5	138.4	263	192.3	179.4
24	17.6	16.4	84	61.4	57.3	144	105.3	98.2	204	149.2	139.1	264	193.1	180.0
25	18.3	17.0	85	62.2	58.0	145	106.0	98.9	205	149.9	139.8	265	193.8	180.7
26	19.0	17.7	86	62.9	58.7	146	106.8	99.6	206	150.7	140.5	266	194.5	181.4
27	19.7	18.4	87	63.6	59.3	147	107.5	100.3	207	151.4	141.2	267	195.3	182.1
28	20.5	19.1	88	64.4	60.0	148	108.2	100.9	208	152.1	141.9	268	196.0	182.8
29	21.2	19.8	89	65.1	60.7	149	109.0	101.6	209	152.9	142.5	269	196.7	183.5
30	21.9	20.5	90	65.8	61.4	150	109.7	102.3	210	153.6	143.2	270	197.5	184.1
31	22.7	21.1	91	66.6	62.1	151	110.4	103.0	211	154.3	143.9	271	198.2	184.8
32	23.4	21.8	92	67.3	62.7	152	111.2	103.7	212	155.0	144.6	272	198.9	185.5
33	24.1	22.5	93	68.0	63.4	153	111.9	104.3	213	155.8	145.3	273	199.7	186.2
34	24.9	23.2	94	68.7	64.1	154	112.6	105.0	214	156.5	145.9	274	200.4	186.9
35	25.6	23.9	95	69.5	64.8	155	113.4	105.7	215	157.2	146.6	275	201.1	187.5
36	26.3	24.6	96	70.2	65.5	156	114.1	106.4	216	158.0	147.3	276	201.9	188.2
37	27.1	25.2	97	70.9	66.2	157	114.8	107.1	217	158.7	148.0	277	202.6	188.9
38	27.8	25.9	98	71.7	66.8	158	115.6	107.8	218	159.4	148.7	278	203.3	189.6
39	28.5	26.6	99	72.4	67.5	159	116.3	108.4	219	160.2	149.4	279	204.0	190.3
40	29.3	27.3	100	73.1	68.2	160	117.0	109.1	220	160.9	150.0	280	204.8	191.0
41	30.0	28.0	101	73.9	68.9	161	117.7	109.8	221	161.6	150.7	281	205.5	191.6
42	30.7	28.6	102	74.6	69.6	162	118.5	110.5	222	162.4	151.4	282	206.2	192.3
43	31.4	29.3	103	75.3	70.2	163	119.2	111.2	223	163.1	152.1	283	207.0	193.0
44	32.2	30.0	104	76.1	70.9	164	119.9	111.8	224	163.8	152.8	284	207.7	193.7
45	32.9	30.7	105	76.8	71.6	165	120.7	112.5	225	164.6	153.4	285	208.4	194.4
46	33.6	31.4	106	77.5	72.3	166	121.4	113.2	226	165.3	154.1	286	209.2	195.1
47	34.4	32.1	107	78.3	73.0	167	122.1	113.9	227	166.0	154.8	287	209 9	195.7
48	35.1	32.7	108	79.0	73.7	168	122.9	114.6	228	166.7	155.5	288	210.6	196.4
49	35.8	33.4	109	79.7	74.3	169	123.6	115.3	229	167.5	156.2	289	211.4	197.1
50	36.6	34.1	110	80.4	75.0	170	124.3	115.9	230	168.2	156.9	290	212.1	197.8
51	37.3	34.8	111	81.2	75.7	171	125.1	116.6	231	168.9	157.5	291	212.8	198.5
52	38.0	35.5	112	81.9	76.4	172	125.8	117.3	232	169.7	158.2	292	213.6	199.1
53	38.8	36.1	113	82.6	77.1	173	126.5	118.0	233	170.4	158.9	293	214.3	199.8
54	39.5	36.8	114	83.4	77.7	174	127.3	118.7	234	171.1	159.6	294	215.0	200.5
55	40.2	37.5	115	84.1	78.4	175	128.0	119.3	235	171.9	160.3	295	215.7	201.2
56	41.0	38.2	116	84.8	79.1	176	128.7	120.0	236	172.6	161.0	296	216.5	201.9
57	41.7	38.9	117	85.6	79.8	177	129.4	120.7	237	173.3	161.6	297	217.2	202.6
58	42.4	39.6	118	86.3	80.5	178	130.2	121.4	238	174.1	162.3	298	217.9	203.2
59	43.1	40.2	119	87.0	81.2	179	130.9	122.1	239	174.8	163.0	299	218.7	203.9
60	43.9	40.9	120	87.8	81.8	180	131.6	122.8	240	175.5	163.7	300	219.4	204.6

Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 42 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	45.3	40.8	121	89.9	81.0	181	134.5	121.1	241	179.1	161.3
2	01.5	01.3	62	46.1	41.5	122	90.7	81.6	182	135.3	121.8	242	179.8	161.9
3	02.2	02.0	63	46.8	42.2	123	91.4	82.3	183	136.0	122.5	243	180.6	162.6
4	03.0	02.7	64	47.6	42.8	124	92.1	83.0	184	136.7	123.1	244	181.3	163.3
5	03.7	03.3	65	48.3	43.5	125	92.9	83.6	185	137.5	123.8	245	182.1	163.9
6	04.5	04.0	66	49.0	44.2	126	93.6	84.3	186	138.2	124.5	246	182 8	164.6
7	05.2	04.7	67	49.8	44.8	127	94.4	85.0	187	139.0	125.1	247	183.6	165.3
8	05.9	05.4	68	50.5	45.5	128	95.1	85.6	188	139.7	125.8	248	184.3	165.9
9	06.7	06 0	69	51.3	46.2	129	95.9	86.3	189	140.5	126.5	249	185.0	166.6
10	07.4	06.7	70	52.0	46.8	130	96.6	87.0	190	141.2	127.1	250	185.8	167.3
11	08.2	07.4	71	52.8	47.5	131	97.4	87.7	191	141.9	127.8	251	186.5	168.0
12	08.9	08.0	72	53.5	48.2	132	98.1	88.3	192	142.7	128.5	252	187.3	168.6
13	09.7	08.7	73	54.2	48.8	133	98.8	89.0	193	143.4	129.1	253	188.0	169.3
14	10.4	09.4	74	55.0	49.5	134	99.6	89.7	194	144.2	129.8	254	188.8	170.0
15	11.1	10.0	75	55.7	50.2	135	100.3	90.3	195	144.9	130.5	255	189.5	170.6
16	11.9	10.7	76	56.5	50.9	136	101.1	91.0	196	145.7	131.1	256	190.2	171.3
17	12.6	11.4	77	57.2	51.5	137	101.8	91.7	197	146.4	131.8	257	191.0	172.0
18	13.4	12.0	78	58.0	52.2	138	102.6	92.3	198	147.1	132.5	258	191.7	172.6
19	14.1	12.7	79	58.7	52.9	139	103.3	93.0	199	147.9	133.2	259	192.5	173.3
20	14.9	13.4	80	59.5	53.5	140	104.0	93.7	200	148.6	133.8	260	193.2	174.0
21	15.0	14.1	81	60.2	54.2	141	104.8	94.3	201	149.4	134.5	261	194.0	174.6
22	16.3	14.7	82	60.9	54.9	142	105.5	95.0	202	150.1	135.2	262	194.7	175.3
23	17.1	15.4	83	61.7	55.5	143	106.3	95.7	203	150.9	135.8	263	195.4	176.0
24	17.8	16.1	84	62.4	56.2	144	107.0	96.4	204	151.6	136.5	264	196.2	176.7
25	18.6	16.7	85	63.2	56.9	145	107.8	97.0	205	152.3	137.2	265	196.9	177.3
26	19.3	17.4	86	63.9	57.5	146	108.5	97.7	206	153.1	137.8	266	197.7	178.0
27	20.1	18.1	87	64.7	58.2	147	109.2	98.4	207	153.8	138.5	267	198.4	178.7
28	20.8	18.7	88	65.4	58.9	148	110.0	99.0	208	154.6	139.2	268	199.2	179.3
29	21.6	19.4	89	66.1	59.6	149	110.7	99.7	209	155.3	139.8	269	199.9	180.0
30	22.3	20.1	90	66.9	60.2	150	111.5	100.4	210	156.1	140.5	270	200.6	180.7
31	23.0	20.7	91	67.6	60.9	151	112.2	101.0	211	156.8	141.2	271	201.4	181.3
32	23.8	21.4	92	68.4	61.6	152	113.0	101.7	212	157.5	141.9	272	202.1	182.0
33	24.5	22.1	93	69.1	62.2	153	113.7	102.4	213	158.3	142.5	273	202.9	182.7
34	25.3	22.8	94	69.9	62.9	154	114.4	103.0	214	159.0	143.2	274	203.6	183.3
35	26.0	23.4	95	70.6	63.6	155	115.2	103.7	215	159.8	143.9	275	204.4	184.0
36	26.8	24.1	96	71.3	64.2	156	115.9	104.4	216	160.5	144.5	276	205.1	184.7
37	27.5	24.8	97	72.1	64.9	157	116.7	105.1	217	161.3	145.2	277	205.9	185.3
38	28.2	25.4	98	72.8	65.6	158	117.4	105.7	218	162.0	145.9	278	206.6	186.0
39	29.0	26.1	99	73.6	66.2	159	118.2	106.4	219	162.7	146.5	279	207.3	186.7
40	29.7	26.8	100	74.3	66.9	160	118.9	107.1	220	163.5	147.2	280	208.1	187.4
41	30.5	27.4	101	75.1	67.6	161	119.6	107.7	221	164.2	147.9	281	208.8	188.0
42	31.2	28.1	102	75.8	68.3	162	120.4	108.4	222	165.0	148.5	282	209.6	188.7
43	32.0	28.8	103	76.5	68.9	163	121.1	109.1	223	165.7	149.2	283	210.3	189.4
44	32.7	29.4	104	77.3	69.6	164	121.9	109.7	224	166.5	149.9	284	211.1	190.0
45	33.4	30.1	105	78.0	70.3	165	122.6	110.4	225	167.2	150.6	285	211.8	190.7
46	34.2	30.8	106	78.8	70.9	166	123.4	111.1	226	168.0	151.2	286	212.5	191.4
47	34.9	31.4	107	79.5	71.6	167	124.1	111.7	227	168.7	151.9	287	213.3	192.0
48	35.7	32.1	108	80.3	72.3	168	124.8	112.4	228	169.4	152.6	288	214.0	192.7
49	36.4	32.8	109	81.0	72.9	169	125.6	113.1	229	170.2	153.2	289	214.8	193.4
50	37.2	33.5	110	81.7	73.6	170	126.3	113.8	230	170.9	153.9	290	215.5	194.0
51	37.9	34.1	111	82.5	74.3	171	127.1	114.4	231	171.7	154.6	291	216.3	194.7
52	38.6	34.8	112	83.2	74.9	172	127.8	115.1	232	172.4	155.2	292	217.0	195.4
53	39.4	35.5	113	84.0	75.6	173	128.6	115.8	233	173.2	155.9	293	217.7	196.1
54	40.1	36.1	114	84.7	76.3	174	129.3	116.4	234	173.9	156.6	294	218.5	196.7
55	40.9	36.8	115	85.5	77.0	175	130.1	117.1	235	174.6	157.2	295	219.2	197.4
56	41.6	37.5	116	86.2	77.6	176	130.8	117.8	236	175.4	157.9	296	220.0	198.1
57	42.4	38.1	117	86.9	78.3	177	131.5	118.4	237	176.1	158.6	297	220.7	198.7
58	43.1	38.8	118	87.7	79.0	178	132.3	119.1	238	176.9	159.3	298	221.5	199.4
59	43.8	39.5	119	88.4	79.6	179	133.0	119.8	239	177.6	159.9	299	222.2	200.1
60	44.6	40.1	120	89.2	80.3	180	133.8	120.4	240	178.4	160.6	300	222.9	200.7
Dist	*Dep.*	*Lat.*	*Dist*	*Dep.*	*Lat.*	*Dist*	*Dep.*	*Lat.*	*Dist*	*Dep.*	*Lat.*	*Dist*	*Dep*	*Lat.*

Difference of Latitude and Departure for 43 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	44.6	41.6	121	88.5	82.5	181	132.4	123.4	241	176.3	164.4
2	01.5	01.4	62	45.3	42.3	122	89.2	83.2	182	133.1	124.1	242	177.0	165.0
3	02.2	02.0	63	46.1	43.0	123	90.0	83.9	183	133.8	124.8	243	177.7	165.7
4	02.9	02.7	64	46.8	43.6	124	90.7	84.6	184	134.6	125.5	244	178.5	166.4
5	03.7	03.4	65	47.5	44.3	125	91 4	85.2	185	135.3	126.2	245	179.2	167.1
6	04.4	04.1	66	48.3	45.0	126	92.2	85.9	186	136.0	126.9	246	179.9	167.8
7	05.1	04.8	67	49.0	45.7	127	92.9	86.6	187	136.8	127.5	247	180.6	168.5
8	05.9	05.5	68	49.7	46.4	128	93.6	87.3	188	137.5	128.2	248	181.4	169.1
9	06.6	06.1	69	50.5	47.1	129	94.3	88.0	189	138.2	128.9	249	182.1	169.8
10	07.3	06.8	70	51.2	47.7	130	95.1	88.7	190	139.0	129.6	250	182.8	170.5
11	08.0	07.5	71	51.9	48.4	131	95.8	89.3	191	139.7	130.3	251	183.6	171.2
12	08 8	08.2	72	52.7	49.1	132	96.5	90.0	192	140.4	130.9	252	184.3	171.9
13	09.5	08.9	73	53.4	49.8	133	97.3	90.7	193	141.2	131.6	253	185.0	172.5
14	10.2	09.5	74	54.1	50.5	134	98.0	91.4	194	141.9	132.3	254	185.8	173.2
15	11.0	10.2	75	54.9	51.1	135	98.7	92.1	195	142.6	133.0	255	186.5	173.9
16	11.7	10.9	76	55.6	51.8	136	99.5	92.8	196	143.3	133.7	256	187.2	174.6
17	12.4	11.6	77	56.3	52.5	137	100.2	93.4	197	144.1	134.4	257	188.0	175.3
18	13.2	12.3	78	57.0	53.2	138	100.9	94.1	198	144.8	135.0	258	188.7	176.0
19	13.9	13.0	79	57.8	53.9	139	101.7	94.8	199	145.5	135.7	259	189.4	176.6
20	14.6	13.6	80	58.5	54.6	140	102.4	95.5	200	146.3	136.4	260	190.2	177.3
21	15.4	14.3	81	59.2	55.2	141	103.1	96.2	201	147.0	137.1	261	190.9	178.0
22	16.1	15.0	82	60.0	55.9	142	103.9	96.8	202	147.7	137.8	262	191.6	178.7
23	16.8	15.7	83	60.7	56.6	143	104.6	97.5	203	148.5	138.4	263	192.3	179.4
24	17.6	16.4	84	61.4	57.3	144	105.3	98.2	204	149.2	139.1	264	193.1	180.0
25	18.3	17.0	85	62.2	58.0	145	106.0	98.9	205	149.9	139.8	265	193.8	180.7
26	19.0	17.7	86	62.9	58.7	146	106.8	99.6	206	150.7	140.5	266	194.5	181.4
27	19.7	18.4	87	63.6	59.3	147	107.5	100.3	207	151.4	141.2	267	195.3	182.1
28	20.5	19.1	88	64.4	60.0	148	108.2	100.9	208	152.1	141.9	268	196.0	182.8
29	21.2	19.8	89	65.1	60.7	149	109.0	101.6	209	152.9	142.5	269	196.7	183.5
30	21.9	20.5	90	65.8	61.4	150	109.7	102.3	210	153.6	143.2	270	197.5	184.1
31	22.7	21.1	91	66.6	62.1	151	110.4	103.0	211	154.3	143.9	271	198.2	184.8
32	23.4	21.8	92	67.3	62.7	152	111.2	103.7	212	155.0	144.6	272	198.9	185.5
33	24.1	22.5	93	68.0	63.4	153	111.9	104.3	213	155.8	145.3	273	199.7	186.2
34	24.9	23.2	94	68.7	64.1	154	112.6	105.0	214	156.5	145.9	274	200.4	186.9
35	25.6	23.9	95	69.5	64.8	155	113.4	105.7	215	157.2	146.6	275	201.1	187.5
36	26.3	24.6	96	70.2	65.5	156	114.1	106.4	216	158.0	147.3	276	201.9	188.2
37	27.1	25.2	97	70.9	66.2	157	114.8	107.1	217	158.7	148.0	277	202.6	188.9
38	27.8	25.9	98	71.7	66.8	158	115.6	107.8	218	159.4	148.7	278	203.3	189.6
39	28.5	26.6	99	72.4	67.5	159	116.3	108.4	219	160.2	149.4	279	204.0	190.3
40	29.3	27.3	100	73.1	68.2	160	117.0	109.1	220	160.9	150.0	280	204.8	191.0
41	30.0	28.0	101	73.9	68.9	161	117.7	109.8	221	161.6	150.7	281	205.5	191.6
42	30.7	28.6	102	74.6	69.6	162	118.5	110.5	222	162.4	151.4	282	206.2	192.3
43	31.4	29.3	103	75.3	70.2	163	119.2	111.2	223	163.1	152.1	283	207.0	193.0
44	32.2	30.0	104	76.1	70.9	164	119.9	111.8	224	163.8	152.8	284	207.7	193.7
45	32.9	30.7	105	76.8	71.6	165	120.7	112.5	225	164.6	153.4	285	208.4	194.4
46	33.6	31.4	106	77.5	72.3	166	121.4	113.2	226	165.3	154.1	286	209.2	195.1
47	34.4	32.1	107	78.3	73.0	167	122.1	113.9	227	166.0	154.8	287	209 9	195.7
48	35.1	32.7	108	79.0	73.7	168	122.9	114.6	228	166.7	155.5	288	210.6	196.4
49	35.8	33.4	109	79.7	74.3	169	123.6	115.3	229	167.5	156.2	289	211.4	197.1
50	36.6	34.1	110	80.4	75.0	170	124.3	115.9	230	168.2	156.9	290	212.1	197.8
51	37.3	34.8	111	81.2	75.7	171	125.1	116.6	231	168.9	157.5	291	212.8	198.5
52	38.0	35.5	112	81.9	76.4	172	125.8	117.3	232	169.7	158.2	292	213.6	199.1
53	38.8	36.1	113	82.6	77.1	173	126.5	118.0	233	170.4	158.9	293	214.3	199.8
54	39.5	36.8	114	83.4	77.7	174	127.3	118.7	234	171.1	159.6	294	215.0	200.5
55	40.2	37.5	115	84.1	78.4	175	128.0	119.3	235	171.9	160.3	295	215.7	201.2
56	41.0	38.2	116	84.8	79.1	176	128.7	120.0	236	172.6	161.0	296	216.5	201.9
57	41.7	38.9	117	85.6	79.8	177	129.4	120.7	237	173.3	161.6	297	217.2	202.6
58	42.4	39.6	118	86.3	80.5	178	130.2	121.4	238	174.1	162.3	298	217.9	203.2
59	43.1	40.2	119	87.0	81.2	179	130.9	122.1	239	174.8	163.0	299	218.7	203.9
60	43.9	40.9	120	87.8	81.8	180	131.6	122.8	240	175.5	163.7	300	219.4	204.6
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II.

Difference of Latitude and Departure for 44 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	43.9	42.4	121	87.0	84.1	181	130.2	125.7	241	173.4	167.4
2	01.4	01.4	62	44.6	43.1	122	87.8	84.7	182	130.9	126.4	242	174.1	168.1
3	02.2	02.1	63	45.3	43.8	123	88.5	85.4	183	131.6	127.1	243	174.8	168.8
4	02.9	02.8	64	46.0	44.5	124	89.2	86.1	184	132.4	127.8	244	175.5	169.5
5	03.6	03.5	65	46.8	45.2	125	89.9	86.8	185	133.1	128.5	245	176.2	170.2
6	04.3	04.2	66	47.5	45.8	126	90.6	87.5	186	133.8	129.2	246	177.0	170.9
7	05.0	04.9	67	48.2	46.5	127	91.4	88.2	187	134.5	129.9	247	177.7	171.6
8	05.8	05.6	68	48.9	47.2	128	92.1	88.9	188	135.2	130.6	248	178.4	172.3
9	06.5	06.3	69	49.6	47.9	129	92.8	89.6	189	136.0	131.3	249	179.1	173.0
10	07.2	06.9	70	50.4	48.6	130	93.5	90.3	190	136.7	132.0	250	179.8	173.7
11	07.9	07.6	71	51.1	49.3	131	94.2	91.0	191	137.4	132.7	251	180.6	174.4
12	08.6	08.3	72	51.8	50.0	132	95.0	91.7	192	138.1	133.4	252	181.3	175.1
13	09.4	09 0	73	52.5	50.7	133	95.7	92.4	193	138.8	134.1	253	182.0	175.7
14	10.1	09.7	74	53.2	51.4	134	96.4	93.1	194	139.6	134.8	254	182.7	176.4
15	10.8	10.4	75	54.0	52.1	135	97.1	93.8	195	140.3	135.5	255	183.4	177.1
16	11.5	11.1	76	54.7	52.8	136	97.8	94.5	196	141.0	136.2	256	184.2	177.8
17	12.2	11.8	77	55.4	53.5	137	98.5	95.2	197	141.7	136.8	257	184.9	178.5
18	12.9	12.5	78	56.1	54.2	138	99.3	95.9	198	142.4	137.5	258	185.6	179.2
19	13.7	13.2	79	56.8	54.9	139	100.0	96.6	199	143.1	138.2	259	186.3	179.9
20	14.4	13.9	80	57.5	55.6	140	100 7	97.3	200	143.9	138.9	260	187.0	180.6
21	15.1	14.6	81	58.3	56.3	141	101.4	97.9	201	144.6	139.6	261	187.7	181.3
22	15.8	15.3	82	59.0	57.0	142	102.1	98.6	202	145.3	140.3	262	188.5	182.0
23	16.5	16.0	83	59.7	57.7	143	102.9	99.3	203	146.0	141.0	263	189.2	182.7
24	17.3	16.7	84	60.4	58.4	144	103.6	100.0	204	146.7	141.7	264	189.9	183.4
25	18.0	17.4	85	61.1	59.0	145	104.3	100.7	205	147.5	142.4	265	190.6	184.1
26	18.7	18.1	86	61.9	59.7	146	105.0	101.4	206	148.2	143.1	266	191.3	184.8
27	19.4	18.8	87	62.6	60.4	147	105.7	102.1	207	148.9	143.8	267	192.1	185.5
28	20.1	19.5	88	63.3	61.1	148	106.5	102.8	208	149.6	144.5	268	192.8	186.2
29	20.9	20.1	89	64.0	61.8	149	107.2	103.5	209	150.3	145.2	269	193.5	186.9
30	21.6	20.8	90	64.7	62.5	150	107.9	104.2	210	151.1	145 9	270	194.2	187.6
31	22.3	21.5	91	65.5	63.2	151	108.6	104.9	211	151.8	146.6	271	194.9	188.3
32	23.0	22.2	92	66.2	63.9	152	109.3	105.6	212	152.5	147.3	272	195.7	188.9
33	23.7	22.9	93	66.9	64.6	153	110.1	106.3	213	153.2	148.0	273	196.4	189.6
34	24.5	23.6	94	67.6	65.3	154	110.8	107.0	214	153.9	148.7	274	197.1	190.3
35	25.2	24.3	95	68.3	66.0	155	111.5	107.7	215	154.7	149.4	275	197.8	191.0
36	25.9	25.0	96	69.1	66.7	156	112.2	108.4	216	155.4	150.0	276	198.5	191.7
37	26.6	25.7	97	69.8	67.4	157	112.9	109.1	217	156.1	150.7	277	199.3	192.4
38	27.3	26.4	98	70.5	68.1	158	113.7	109.8	218	156.8	151.4	278	200.0	193.1
39	28.1	27.1	99	71.2	68.8	159	114.4	110.5	219	157.5	152.1	279	200.7	193.8
40	28.8	27.8	100	71.9	69.5	160	115.1	111.1	220	158.3	152.8	280	201.4	194.5
41	29.5	28.5	101	72.7	70.2	161	115.8	111.8	221	159.0	153.5	281	202.1	195.2
42	30.2	29.2	102	73.4	70.9	162	116.5	112.5	222	159.7	154.2	282	202.9	195.9
43	30.9	29.9	103	74.1	71.5	163	117.3	113.2	223	160.4	154.9	283	203.6	196.6
44	31.7	30.6	104	74.8	72.2	164	118.0	113.9	224	161.1	155.6	284	204.3	197.3
45	32.4	31.3	105	75.5	72.9	165	118.7	114.6	225	161.9	156.3	285	205.0	198.0
46	33.1	32.0	106	76.3	73.6	166	119.4	115.3	226	162.6	157.0	286	205.7	198.7
47	33.8	32.6	107	77.0	74.3	167	120.1	116.0	227	163.3	157.7	287	206.5	199.4
48	34.5	33.3	108	77.7	75.0	168	120.8	116.7	228	164.0	158.4	288	207.2	200.1
49	35.2	34.0	109	78.4	75.7	169	121.6	117.4	229	164.7	159.1	289	207.9	200.8
50	36.0	34.7	110	79.1	76.4	170	122.3	118.1	230	165.4	159.8	290	208.6	201.5
51	36.7	35.4	111	79.8	77.1	171	123.0	118.8	231	166.2	160.5	291	209.3	202.1
52	37.4	36.1	112	80.6	77.8	172	123.7	119.5	232	166.9	161.2	292	210.0	202.8
53	38.1	36.8	113	81.3	78.5	173	124.4	120.2	233	167.6	161.9	293	210.8	203.5
54	38.8	37.5	114	82.0	79.2	174	125.2	120.9	234	168.3	162.6	294	211.5	204.2
55	39.6	38.2	115	82.7	79.9	175	125.9	121.6	235	169.0	163.2	295	212.2	204.9
56	40.3	38.9	116	83.4	80.6	176	126.6	122.3	236	169.8	163.9	296	212.9	205.6
57	41.0	39.6	117	84.2	81.3	177	127.3	123.0	237	170.5	164.6	297	213.6	206.3
58	41.7	40.3	118	84.9	82.0	178	128.0	123.6	238	171.2	165.3	298	214.4	207.0
59	42.4	41.0	119	85.6	82.7	179	128.8	124.3	239	171.9	166.0	299	215.1	207.7
60	43.2	41.7	120	86.3	83.4	180	129.5	125.0	240	172.6	166.7	300	215.8	208.4
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 46 Degrees.

Difference of Latitude and Departure for 45 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	43.1	43.1	121	85.6	85.6	181	128.0	128.0	241	170.4	170.4
2	01.4	01.4	62	43.8	43.8	122	86.3	86.3	182	128.7	128.7	242	171.1	171.1
3	02.1	02.1	63	44.5	44.5	123	87.0	87.0	183	129.4	129.4	243	171.8	171.8
4	02.8	02.8	64	45.3	45.3	124	87.7	87.7	184	130.1	130.1	244	172.5	172.5
5	03.5	03.5	65	46.0	46.0	125	88.4	88.4	185	130.8	130.8	245	173.2	173.2
6	04.2	04.2	66	46.7	46.7	126	89.1	89.1	186	131.5	131.5	246	173.9	173.9
7	04.9	04.9	67	47.4	47.4	127	89.8	89.8	187	132.2	132.2	247	174.7	174.7
8	05.7	05.7	68	48.1	48.1	128	90.5	90.5	188	132.9	132 9	248	175.4	175.4
9	06.4	06.4	69	48.8	48.8	129	91.2	91.2	189	133.6	133.6	249	176.1	176.1
10	07.1	07.1	70	49.5	49.5	130	91.9	91.9	190	134.4	134.4	250	176.8	176.8
11	07.8	07.8	71	50.2	50.2	131	92.6	92.6	191	135.1	135.1	251	177.5	177.5
12	08.5	08.5	72	50.9	50.9	132	93.3	93.3	192	135.8	135.8	252	178.2	178.2
13	09.2	09.2	73	51.6	51.6	133	94.0	94.0	193	136.5	136.5	253	178.9	178.9
14	09.9	09.9	74	52.3	52.3	134	94.8	94.8	194	137.2	137.2	254	179.6	179.6
15	10.6	10.6	75	53.0	53.0	135	95.5	95.5	195	137.9	137.9	255	180.3	180.3
16	11.3	11.3	76	53.7	53.7	136	96.2	96.2	196	138.6	138.6	256	181.0	181.0
17	12.0	12.0	77	54.4	54.4	137	96.9	96.9	197	139.3	139.3	257	181.7	181.7
18	12.7	12.7	78	55.2	55.2	138	97.6	97.6	198	140.0	140.0	258	182.4	182.4
19	13.4	13.4	79	55.9	55.9	139	98.3	98.3	199	140.7	140.7	259	183.1	183.1
20	14.1	14.1	80	56.6	56.6	140	99.0	99.0	200	141.4	141.4	260	183.8	183.8
21	14.8	14.8	81	57.3	57.3	141	99.7	99.7	201	142.1	142.1	261	184.6	184.6
22	15.6	15.6	82	58.0	58.0	142	100.4	100.4	202	142.8	142.8	262	185.3	185.3
23	16.3	16.3	83	58.7	58.7	143	101.1	101.1	203	143.5	143.5	263	186.0	186.0
24	17.0	17.0	84	59.4	59.4	144	101.8	101.8	204	144.2	144.2	264	186.7	186.7
25	17.7	17.7	85	60.1	60.1	145	102.5	102.5	205	145.0	145.0	265	187.4	187.4
26	18.4	18.4	86	60.8	60.8	146	103.2	103.2	206	145.7	145.7	266	188.1	188.1
27	19.1	19.1	87	61.5	61.5	147	103.9	103.9	207	146.4	146.4	267	188.8	188.8
28	19.8	19.8	88	62.2	62.2	148	104.7	104.7	208	147.1	147.1	268	189.5	189.5
29	20.5	20.5	89	62.9	62.9	149	105.4	105.4	209	147.8	147.8	269	190.2	190.2
30	21.2	21.2	90	63.6	63.6	150	106.1	106.1	210	148.5	148.5	270	190.9	190.9
31	21.9	21.9	91	64.3	64.3	151	106.8	106.8	211	149.2	149.2	271	191.6	191.6
32	22.6	22.6	92	65.1	65.1	152	107.5	107.5	212	149.0	149.9	272	192.3	192.3
33	23.3	23.3	93	65.8	65.8	153	108.2	108.2	213	150.6	150.6	273	193.0	193.0
34	24.0	24.0	94	66.5	66.5	154	108.9	108.9	214	151.3	151.3	274	193.7	193.7
35	24.7	24.7	95	67.2	67.2	155	109.6	109.6	215	152.0	152.0	275	194.5	194.5
36	25.5	25.5	96	67.9	67.9	156	110.3	110.3	216	152.7	152.7	276	195.2	195.2
37	26.2	26.2	97	68.6	68.6	157	111.0	111.0	217	153.4	153.4	277	195.9	195.9
38	26.9	26.9	98	69.3	69.3	158	111.7	111.7	218	154.1	154.1	278	196.6	196.6
39	27.6	27.6	99	70.0	70.0	159	112.4	112.4	219	154.9	154.9	279	197.3	197.3
40	28.3	28.3	100	70.7	70.7	160	113.1	113.1	220	155.6	155.6	280	198.0	198.0
41	29.0	29.0	101	71.4	71.4	161	113.8	113.8	221	156.3	156.3	281	198.7	198.7
42	29.7	29.7	102	72.1	72.1	162	114.6	114.6	222	157.0	157.0	282	199.4	199.4
43	30.4	30.4	103	72.8	72.8	163	115.3	115.3	223	157.7	157.7	283	200.1	200.1
44	31.1	31.1	104	73.5	73.5	164	116.0	116.0	224	158.4	158.4	284	200.8	200.8
45	31.8	31.8	105	74.2	74.2	165	116.7	116.7	225	159.1	159.1	285	201.5	201.5
46	32.5	32.5	106	75.0	75.0	166	117.4	117.4	226	159.8	159.8	286	202.2	202.2
47	33.2	33.2	107	75.7	75.7	167	118.1	118.1	227	160.5	160.5	287	202.9	202.9
48	33.9	33.9	108	76.4	76.4	168	118.8	118.8	228	161.2	161.2	288	203.6	203.6
49	34.6	34.6	109	77.1	77.1	169	119.5	119.5	229	161.9	161.9	289	204.4	204.4
50	35.4	35.4	110	77.8	77.8	170	120.2	120.2	230	162.6	162.6	290	205.1	205.1
51	36.1	36.1	111	78.5	78.5	171	120.9	120.9	231	163.3	163.3	291	205.8	205.8
52	36.8	36.8	112	79.2	79.2	172	121.6	121.6	232	164.0	164.0	292	206.5	206.5
53	37.5	37.5	113	79.9	79.9	173	122.3	122.3	233	164.8	164.8	293	207.2	207.2
54	38.2	38.2	114	80.6	80.6	174	123.0	123.0	234	165.5	165.5	294	207.9	207.9
55	38.9	38.9	115	81.3	81.3	175	123.7	123.7	235	166.2	166.2	295	208.6	208.6
56	39.6	39.6	116	82.0	82.0	176	124.5	124.5	236	166.9	166.9	296	209.3	209.3
57	40.3	40.3	117	82.7	82.7	177	125.2	125.2	237	167.6	167.6	297	210.0	210.0
58	41.0	41.0	118	83.4	83.4	178	125.9	125.9	238	168.3	168.3	298	210.7	210.7
59	41.7	41.7	119	84.1	84.1	179	126.6	126.6	239	169.0	169.0	299	211.4	211.4
60	42.4	42.4	120	84.9	84.9	180	127.3	127.3	240	169.7	169.7	300	212.1	212.1
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III.

MERIDIONAL PARTS.

M	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	M
0	0	60	120	180	240	300	361	421	482	542	603	664	725	787	848	910	0
1	1	61	121	181	241	301	362	422	483	543	604	665	726	788	850	911	1
2	2	62	122	182	242	302	363	423	484	544	605	666	727	789	851	913	2
3	3	63	123	183	243	303	364	424	485	545	606	667	728	790	852	914	3
4	4	64	124	184	244	304	365	425	486	546	607	668	729	791	853	915	4
5	5	65	125	185	245	305	366	426	487	547	608	669	730	792	854	916	5
6	6	66	126	186	246	306	367	427	488	548	609	670	731	793	855	917	6
7	7	67	127	187	247	307	368	428	489	549	610	671	732	794	856	918	7
8	8	68	128	188	248	308	369	429	490	550	611	672	734	795	857	919	8
9	9	69	129	189	249	309	370	430	491	551	612	673	735	796	858	920	9
10	10	70	130	190	250	310	371	431	492	552	613	674	736	797	859	921	10
11	11	71	131	191	251	311	372	432	493	553	614	675	737	798	860	922	11
12	12	72	132	192	252	312	373	433	494	554	615	676	738	799	861	923	12
13	13	73	133	193	253	313	374	434	495	555	616	677	739	800	862	924	13
14	14	74	134	194	254	314	375	435	496	556	617	678	740	801	863	925	14
15	15	75	135	195	255	315	376	436	497	557	618	679	741	802	864	926	15
16	16	76	136	196	256	316	377	437	498	558	619	680	742	803	865	927	16
17	17	77	137	197	257	317	378	438	499	559	620	681	743	804	866	928	17
18	18	78	138	198	258	318	379	439	500	560	621	682	744	805	867	929	18
19	19	79	139	199	259	319	380	440	501	561	622	683	745	806	868	930	19
20	20	80	140	200	260	320	381	441	502	562	623	684	746	807	869	931	20
21	21	81	141	201	261	321	382	442	503	564	624	685	747	808	870	932	21
22	22	82	142	202	262	322	383	443	504	565	625	687	748	809	871	933	22
23	23	83	143	203	263	323	384	444	505	566	626	688	749	810	872	934	23
24	24	84	144	204	264	324	385	445	506	567	627	689	750	811	873	935	24
25	25	85	145	205	265	325	386	446	507	568	628	690	751	812	874	936	25
26	26	86	146	206	266	326	387	447	508	569	629	691	752	813	875	937	26
27	27	87	147	207	267	327	388	448	509	570	631	692	753	815	876	938	27
28	28	88	148	208	268	328	389	449	510	571	632	693	754	816	877	939	28
29	29	89	149	209	269	330	390	450	511	572	633	694	755	817	878	941	29
30	30	90	150	210	270	331	391	451	512	573	634	695	756	818	879	942	30
31	31	91	151	211	271	332	392	452	513	574	635	696	757	819	880	943	31
32	32	92	152	212	272	333	393	453	514	575	636	697	758	820	882	944	32
33	33	93	153	213	273	334	394	454	515	576	637	698	759	821	883	945	33
34	34	94	154	214	274	335	395	455	516	577	638	699	760	822	884	946	34
35	35	95	155	215	275	336	396	456	517	578	639	700	761	823	885	947	35
36	36	96	156	216	276	337	397	457	518	579	640	701	762	824	886	948	36
37	37	97	157	217	277	338	398	458	519	580	641	702	763	825	887	949	37
38	38	98	158	218	278	339	399	459	520	581	642	703	764	826	888	950	38
39	39	99	159	219	279	340	400	460	521	582	643	704	765	827	889	951	39
40	40	100	160	220	280	341	401	461	522	583	644	705	766	828	890	952	40
41	41	101	161	221	281	342	402	462	523	584	645	706	767	829	891	953	41
42	42	102	162	222	282	343	403	463	524	585	646	707	768	830	892	954	42
43	43	103	163	223	283	344	404	464	525	586	647	708	769	831	893	955	43
44	44	104	164	224	284	345	405	465	526	587	648	709	770	832	894	956	44
45	45	105	165	225	285	346	406	466	527	588	649	710	771	833	895	957	45
46	46	106	166	226	286	347	407	467	528	589	650	711	772	834	896	958	46
47	47	107	167	227	287	348	408	468	529	590	651	712	773	835	897	959	47
48	48	108	168	228	288	349	409	469	530	591	652	713	774	836	898	960	48
49	49	109	169	229	289	350	410	470	531	592	653	714	775	837	899	961	49
50	50	110	170	230	290	351	411	471	532	593	654	715	777	838	900	962	50
51	51	111	171	231	291	352	412	472	533	594	655	716	778	839	901	963	51
52	52	112	172	232	292	353	413	473	534	595	656	717	779	840	902	964	52
53	53	113	173	233	293	354	414	474	535	596	657	718	780	841	903	965	53
54	54	114	174	234	294	355	415	476	536	597	658	719	781	842	904	966	54
55	55	115	175	235	295	356	416	477	537	598	659	720	782	843	905	968	55
56	56	116	176	236	296	357	417	478	538	599	660	721	783	844	906	969	56
57	57	117	177	237	297	358	418	479	539	600	661	722	784	845	907	970	57
58	58	118	178	238	298	359	419	480	540	601	662	723	785	846	908	971	58
59	59	119	179	239	299	360	420	481	541	602	663	724	786	847	909	972	59
M	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	M

MERIDIONAL PARTS.

M	16°	17°	18°	19°	20°	21°	22°	23°	24°	25°	26°	27°	28°	M
0	973	1035	1098	1161	1225	1289	1354	1419	1484	1550	1616	1684	1751	0
1	974	1036	1099	1163	1226	1290	1355	1420	1485	1551	1618	1685	1752	1
2	975	1037	1100	1164	1227	1291	1356	1421	1486	1552	1619	1686	1753	2
3	976	1038	1101	1165	1228	1292	1357	1422	1487	1553	1620	1687	1755	3
4	977	1039	1102	1166	1229	1293	1358	1423	1488	1554	1621	1688	1756	4
5	978	1041	1103	1167	1230	1295	1359	1424	1490	1556	1622	1689	1757	5
6	979	1042	1105	1168	1232	1296	1360	1425	1491	1557	1623	1690	1758	6
7	980	1043	1106	1169	1233	1297	1361	1426	1492	1558	1624	1691	1759	7
8	981	1044	1107	1170	1234	1298	1362	1427	1493	1559	1625	1693	1760	8
9	982	1045	1108	1171	1235	1299	1363	1428	1494	1560	1626	1694	1761	9
10	983	1046	1109	1172	1236	1300	1364	1430	1495	1561	1628	1695	1762	10
11	984	1047	1110	1173	1237	1301	1366	1431	1496	1562	1629	1696	1764	11
12	985	1048	1111	1174	1238	1302	1367	1432	1497	1563	1630	1697	1765	12
13	986	1049	1112	1175	1239	1303	1368	1433	1498	1564	1631	1698	1766	13
14	987	1050	1113	1176	1240	1304	1369	1434	1499	1565	1632	1699	1767	14
15	988	1051	1114	1177	1241	1305	1370	1435	1500	1567	1633	1700	1768	15
16	989	1052	1115	1178	1242	1306	1371	1436	1502	1568	1634	1701	1769	16
17	990	1053	1116	1179	1243	1307	1372	1437	1503	1569	1635	1703	1770	17
18	991	1054	1117	1181	1244	1308	1373	1438	1504	1570	1637	1704	1772	18
19	993	1055	1118	1182	1245	1310	1374	1439	1505	1571	1638	1705	1773	19
20	994	1056	1119	1183	1246	1311	1375	1440	1506	1572	1639	1706	1774	20
21	995	1057	1120	1184	1248	1312	1376	1441	1507	1573	1640	1707	1775	21
22	996	1058	1121	1185	1249	1313	1377	1443	1508	1574	1641	1708	1776	22
23	997	1059	1122	1186	1250	1314	1379	1444	1509	1575	1642	1709	1777	23
24	998	1060	1123	1187	1251	1315	1380	1445	1510	1577	1643	1711	1778	24
25	999	1061	1125	1188	1252	1316	1381	1446	1511	1578	1644	1712	1780	25
26	1000	1063	1126	1189	1253	1317	1382	1447	1513	1579	1645	1713	1781	26
27	1001	1064	1127	1190	1254	1318	1383	1448	1514	1580	1647	1714	1782	27
28	1002	1065	1128	1191	1255	1319	1384	1449	1515	1581	1648	1715	1783	28
29	1003	1066	1129	1192	1256	1320	1385	1450	1516	1582	1649	1716	1784	29
30	1004	1067	1130	1193	1257	1321	1386	1451	1517	1583	1650	1717	1785	30
31	1005	1068	1131	1194	1258	1322	1387	1452	1518	1584	1651	1718	1786	31
32	1006	1069	1132	1195	1259	1324	1388	1453	1519	1585	1652	1720	1787	32
33	1007	1070	1133	1196	1260	1325	1389	1455	1520	1586	1653	1721	1789	33
34	1008	1071	1134	1198	1261	1326	1390	1456	1521	1588	1654	1722	1790	34
35	1009	1072	1135	1199	1262	1327	1392	1457	1522	1589	1656	1723	1791	35
36	1010	1073	1136	1200	1264	1328	1393	1458	1524	1590	1657	1724	1792	36
37	1011	1074	1137	1201	1265	1329	1394	1459	1525	1591	1658	1725	1793	37
38	1012	1075	1138	1202	1266	1330	1395	1460	1526	1592	1659	1726	1794	38
39	1013	1076	1139	1203	1267	1331	1396	1461	1527	1593	1660	1727	1795	39
40	1014	1077	1140	1204	1268	1332	1397	1462	1528	1594	1661	1729	1797	40
41	1015	1078	1141	1205	1269	1333	1398	1463	1529	1595	1662	1730	1798	41
42	1016	1079	1142	1206	1270	1334	1399	1464	1530	1596	1663	1731	1799	42
43	1018	1080	1144	1207	1271	1335	1400	1465	1531	1598	1664	1732	1800	43
44	1019	1081	1145	1208	1272	1336	1401	1467	1532	1599	1666	1733	1801	44
45	1020	1082	1146	1209	1273	1338	1402	1468	1533	1600	1667	1734	1802	45
46	1021	1084	1147	1210	1274	1339	1403	1469	1535	1601	1668	1735	1803	46
47	1022	1085	1148	1211	1275	1340	1405	1470	1536	1602	1669	1736	1805	47
48	1023	1086	1149	1212	1276	1341	1406	1471	1537	1603	1670	1738	1806	48
49	1024	1087	1150	1213	1277	1342	1407	1472	1538	1604	1671	1739	1807	49
50	1025	1088	1151	1215	1278	1343	1408	1473	1539	1605	1672	1740	1808	50
51	1026	1089	1152	1216	1280	1344	1409	1474	1540	1606	1673	1741	1809	51
52	1027	1090	1153	1217	1281	1345	1410	1475	1541	1608	1675	1742	1810	52
53	1028	1091	1154	1218	1282	1346	1411	1476	1542	1609	1676	1743	1811	53
54	1029	1092	1155	1219	1283	1347	1412	1477	1543	1610	1677	1744	1813	54
55	1030	1093	1156	1220	1284	1348	1413	1479	1544	1611	1678	1746	1814	55
56	1031	1094	1157	1221	1285	1349	1414	1480	1546	1612	1679	1747	1815	56
57	1032	1095	1158	1222	1286	1350	1415	1481	1547	1613	1680	1748	1816	57
58	1033	1096	1159	1223	1287	1352	1416	1482	1548	1614	1681	1749	1817	58
59	1034	1097	1160	1224	1288	1353	1418	1483	1549	1615	1682	1750	1818	59
M	16°	17°	18°	19°	20°	21°	22°	23°	24°	25°	26°	27°	28°	M

TABLE III.

MERIDIONAL PARTS.

M	55°	56°	57°	58°	59°	60°	61°	62°	63°	64°	65°	66°	67°	M
0	3968	4074	4185	4294	4409	4527	4649	4775	4905	5039	5179	5324	5474	0
1	3970	4076	4184	4296	4411	4529	4651	4777	4907	5042	5181	5326	5477	1
2	3971	4077	4186	4298	4413	4531	4653	4779	4909	5044	5184	5328	5479	2
3	3973	4079	4188	4300	4415	4533	4655	4781	4912	5046	5186	5331	5482	3
4	3975	4081	4190	4302	4417	4535	4657	4784	4914	5049	5188	5333	5484	4
5	3977	4083	4192	4304	4419	4537	4660	4786	4916	5051	5191	5336	5487	5
6	3978	4085	4194	4306	4421	4539	4662	4788	4918	5053	5193	5338	5489	6
7	3980	4086	4195	4308	4423	4541	4664	4790	4920	5055	5195	5341	5492	7
8	3982	4088	4197	4309	4425	4543	4666	4792	4923	5058	5198	5343	5495	8
9	3984	4090	4199	4311	4427	4545	4668	4794	4925	5060	5200	5346	5497	9
10	3985	4092	4201	4313	4429	4547	4670	4796	4927	5062	5203	5348	5500	10
11	3987	4094	4203	4315	4431	4549	4672	4798	4929	5065	5205	5351	5502	11
12	3989	4095	4205	4317	4433	4551	4674	4801	4931	5067	5207	5353	5505	12
13	3991	4097	4207	4319	4434	4553	4676	4803	4934	5069	5210	5356	5507	13
14	3992	4099	4208	4321	4436	4555	4678	4805	4936	5071	5212	5358	5510	14
15	3994	4101	4210	4323	4438	4557	4680	4807	4938	5074	5214	5361	5513	15
16	3996	4103	4212	4325	4440	4559	4682	4809	4940	5076	5217	5363	5515	16
17	3998	4104	4214	4327	4442	4562	4684	4811	4943	5078	5219	5366	5518	17
18	3999	4106	4216	4328	4443	4564	4687	4814	4945	5081	5222	5368	5520	18
19	4001	4108	4218	4330	4446	4566	4689	4816	4947	5083	5224	5371	5523	19
20	4003	4110	4220	4332	4448	4568	4691	4818	4949	5085	5226	5373	5526	20
21	4005	4112	4221	4334	4450	4570	4693	4820	4951	5088	5229	5376	5528	21
22	4006	4113	4223	4336	4452	4572	4695	4822	4954	5090	5231	5378	5531	22
23	4008	4115	4225	4338	4454	4574	4697	4824	4956	5092	5234	5380	5533	23
24	4010	4117	4227	4340	4456	4576	4699	4826	4958	5095	5236	5383	5536	24
25	4012	4119	4229	4342	4458	4578	4701	4829	4960	5097	5238	5385	5539	25
26	4014	4121	4231	4344	4460	4580	4703	4831	4963	5099	5241	5388	5541	26
27	4015	4122	4232	4346	4462	4582	4705	4833	4965	5102	5243	5390	5544	27
28	4017	4124	4234	4347	4464	4584	4707	4835	4967	5104	5246	5393	5546	28
29	4019	4126	4236	4349	4466	4586	4710	4837	4969	5106	5248	5395	5549	29
30	4021	4128	4238	4351	4468	4588	4712	4839	4972	5108	5250	5398	5552	30
31	4023	4130	4240	4353	4470	4590	4714	4842	4974	5111	5253	5401	5554	31
32	4024	4132	4242	4355	4472	4592	4716	4844	4976	5113	5255	5403	5557	32
33	4026	4133	4244	4357	4474	4594	4718	4846	4978	5115	5258	5406	5559	33
34	4028	4135	4246	4359	4476	4596	4720	4848	4981	5118	5260	5408	5562	34
35	4029	4137	4247	4361	4478	4598	4722	4850	4983	5120	5263	5411	5565	35
36	4031	4139	4249	4363	4480	4600	4724	4852	4985	5122	5265	5413	5567	36
37	4033	4141	4251	4365	4482	4602	4726	4855	4987	5125	5267	5416	5570	37
38	4035	4142	4253	4367	4484	4604	4728	4857	4990	5127	5270	5418	5573	38
39	4037	4144	4255	4369	4486	4606	4731	4859	4992	5129	5272	5421	5575	39
40	4038	4146	4257	4370	4488	4608	4733	4861	4994	5132	5275	5423	5578	40
41	4040	4148	4259	4372	4490	4610	4735	4863	4996	5134	5277	5426	5580	41
42	4042	4150	4260	4374	4492	4612	4737	4865	4999	5136	5280	5428	5583	42
43	4044	4152	4262	4376	4494	4614	4739	4868	5001	5139	5282	5431	5586	43
44	4045	4153	4264	4378	4495	4616	4741	4870	5003	5141	5284	5433	5588	44
45	4047	4155	4266	4380	4497	4618	4743	4872	5005	5143	5287	5436	5591	45
46	4049	4157	4268	4382	4499	4620	4745	4874	5008	5146	5289	5438	5594	46
47	4051	4159	4270	4384	4501	4623	4747	4876	5010	5148	5292	5441	5596	47
48	4052	4161	4272	4386	4503	4625	4750	4879	5012	5151	5294	5443	5599	48
49	4054	4162	4274	4388	4505	4627	4752	4881	5014	5153	5297	5446	5602	49
50	4056	4164	4275	4390	4507	4629	4754	4883	5017	5155	5299	5448	5604	50
51	4058	4166	4277	4392	4509	4631	4756	4885	5019	5158	5301	5451	5607	51
52	4060	4168	4279	4394	4511	4633	4758	4887	5021	5160	5304	5454	5610	52
53	4061	4170	4281	4396	4513	4635	4760	4890	5023	5162	5306	5456	5612	53
54	4063	4172	4283	4398	4515	4637	4762	4892	5026	5165	5309	5459	5615	54
55	4065	4173	4285	4399	4517	4639	4764	4894	5028	5167	5311	5461	5617	55
56	4067	4175	4287	4401	4519	4641	4766	4896	5030	5169	5314	5464	5620	56
57	4069	4177	4289	4403	4521	4643	4769	4898	5033	5172	5316	5466	5623	57
58	4070	4179	4291	4405	4523	4645	4771	4901	5035	5174	5319	5469	5625	58
59	4072	4181	4292	4407	4525	4647	4773	4903	5037	5176	5321	5471	5628	59
M	55°	56°	57°	58°	59°	60°	61°	62°	63°	64°	65°	66°	67°	M

MERIDIONAL PARTS.

M	68°	69°	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°	M
0	5631	5795	5966	6146	6335	6534	6746	6970	7210	7467	7745	8046	8375	0
1	5633	5797	5969	6149	6338	6538	6749	6974	7214	7472	7749	8051	8381	1
2	5636	5800	5972	6152	6341	6541	6753	6978	7218	7476	7754	8056	8387	2
3	5639	5803	5975	6155	6345	6545	6757	6982	7222	7481	7759	8061	8393	3
4	5642	5806	5978	6158	6348	6548	6760	6986	7227	7485	7764	8067	8398	4
5	5644	5809	5981	6161	6351	6552	6764	6990	7231	7490	7769	8072	8404	5
6	5647	5811	5984	6164	6354	6555	6768	6994	7235	7494	7774	8077	8410	6
7	5650	5814	5986	6167	6358	6558	6771	6997	7239	7498	7778	8083	8416	7
8	5652	5817	5989	6170	6361	6562	6775	7001	7243	7503	7783	8088	8422	8
9	5655	5820	5992	6173	6364	6565	6779	7005	7247	7507	7788	8093	8427	9
10	5658	5823	5995	6177	6367	6569	6782	7009	7252	7512	7793	8099	8433	10
11	5660	5825	5998	6180	6371	6572	6786	7013	7256	7516	7798	8104	8439	11
12	5663	5828	6001	6183	6374	6576	6790	7017	7260	7521	7803	8109	8445	12
13	5666	5831	6004	6186	6377	6579	6793	7021	7264	7525	7808	8115	8451	13
14	5668	5834	6007	6189	6380	6583	6797	7025	7268	7530	7813	8120	8457	14
15	5671	5837	6010	6192	6384	6586	6801	7029	7273	7535	7817	8125	8463	15
16	5674	5839	6013	6195	6387	6590	6804	7033	7277	7539	7822	8131	8469	16
17	5676	5842	6016	6198	6390	6593	6808	7037	7281	7544	7827	8136	8474	17
18	5679	5845	6019	6201	6394	6597	6812	7041	7285	7548	7832	8141	8480	18
19	5682	5848	6022	6205	6397	6600	6815	7045	7289	7553	7837	8147	8486	19
20	5685	5851	6025	6208	6400	6603	6819	7048	7294	7557	7842	8152	8492	20
21	5687	5854	6028	6211	6403	6607	6823	7052	7298	7562	7847	8158	8498	21
22	5690	5856	6031	6214	6407	6610	6826	7056	7302	7566	7852	8163	8504	22
23	5693	5859	6034	6217	6410	6614	6830	7060	7306	7571	7857	8168	8510	23
24	5695	5862	6037	6220	6413	6617	6834	7064	7311	7576	7862	8174	8516	24
25	5698	5865	6040	6223	6417	6621	6838	7068	7315	7580	7867	8179	8522	25
26	5701	5868	6043	6226	6420	6624	6841	7072	7319	7585	7872	8185	8528	26
27	5704	5871	6046	6230	6423	6628	6845	7076	7323	7589	7877	8190	8534	27
28	5706	5874	6049	6233	6427	6631	6849	7080	7328	7594	7882	8196	8540	28
29	5709	5876	6052	6236	6430	6635	6853	7084	7332	7599	7887	8201	8546	29
30	5712	5879	6055	6239	6433	6639	6856	7088	7336	7603	7892	8207	8552	30
31	5715	5882	6058	6242	6437	6642	6860	7092	7341	7608	7897	8212	8558	31
32	5717	5885	6061	6245	6440	6646	6864	7096	7345	7612	7902	8218	8565	32
33	5720	5888	6064	6249	6443	6649	6868	7100	7349	7617	7907	8223	8571	33
34	5723	5891	6067	6252	6447	6653	6871	7104	7353	7622	7912	8229	8577	34
35	5725	5894	6070	6255	6450	6656	6875	7108	7358	7626	7917	8234	8583	35
36	5728	5896	6073	6258	6453	6660	6879	7112	7362	7631	7922	8240	8589	36
37	5731	5899	6076	6261	6457	6663	6883	7116	7366	7636	7927	8245	8595	37
38	5734	5902	6079	6264	6460	6667	6886	7120	7371	7640	7932	8251	8601	38
39	5736	5905	6082	6268	6463	6670	6890	7124	7375	7645	7937	8256	8607	39
40	5739	5908	6085	6271	6467	6674	6894	7128	7379	7650	7942	8262	8614	40
41	5742	5911	6088	6274	6470	6677	6898	7132	7384	7654	7948	8267	8620	41
42	5745	5914	6091	6277	6473	6681	6901	7136	7388	7659	7953	8273	8626	42
43	5747	5917	6094	6280	6477	6685	6905	7140	7392	7664	7958	8279	8632	43
44	5750	5919	6097	6283	6480	6688	6909	7145	7397	7668	7963	8284	8638	44
45	5753	5922	6100	6287	6483	6692	6913	7149	7401	7673	7968	8290	8644	45
46	5756	5925	6103	6290	6487	6695	6917	7153	7406	7678	7973	8295	8651	46
47	5758	5928	6106	6293	6490	6699	6920	7157	7410	7683	7978	8301	8657	47
48	5761	5931	6109	6296	6494	6702	6924	7161	7414	7687	7983	8307	8663	48
49	5764	5934	6112	6299	6497	6706	6928	7165	7419	7692	7989	8312	8669	49
50	5767	5937	6115	6303	6500	6710	6932	7169	7423	7697	7994	8318	8676	50
51	5770	5940	6118	6306	6504	6713	6936	7173	7427	7702	7999	8324	8682	51
52	5772	5943	6121	6309	6507	6717	6940	7177	7431	7706	8004	8329	8688	52
53	5775	5946	6124	6312	6511	6720	6943	7181	7436	7711	8009	8335	8695	53
54	5778	5948	6127	6315	6514	6724	6947	7185	7441	7716	8014	8341	8701	54
55	5781	5951	6130	6319	6517	6728	6951	7189	7445	7721	8020	8347	8707	55
56	5783	5954	6133	6322	6521	6731	6955	7194	7449	7725	8025	8352	8714	56
57	5786	5957	6136	6325	6524	6735	6959	7198	7454	7730	8030	8358	8720	57
58	5789	5960	6140	6328	6528	6738	6963	7202	7458	7735	8035	8364	8726	58
59	5792	5963	6143	6332	6531	6742	6966	7206	7463	7740	8040	8369	8733	59
M	68°	69°	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°	M

TABLE IV.

MEAN REFRACTION.

App. Alt	Refr.	App. Alt.	Refr.	App. Alt.	Refr.	App. Alt.	Refr.	App. Alt.	Refr.
° ′	′ ″	° ′	′ ″	° ′	′ ″	° ′	′ ″	° ′	′ ″
0 0	33 0	5 0	9 54	10 0	5 15	20 0	2 35	34 0	1 24
0 5	32 10	5 5	9 46	10 10	5 10	20 10	2 34	34 30	1 23
0 10	31 22	5 10	9 38	10 20	5 5	20 20	2 32	35 0	1 21
0 15	30 35	5 15	9 30	10 30	5 0	20 30	2 31	35 30	1 20
0 20	29 50	5 20	9 23	10 40	4 56	20 40	2 29	36 0	1 18
0 25	29 6	5 25	9 15	10 50	4 51	20 50	2 28	36 30	1 17
0 30	28 23	5 30	9 8	11 0	4 47	21 0	2 27	37 0	1 16
0 35	27 41	5 35	9 1	11 10	4 43	21 10	2 26	37 30	1 14
0 40	27 0	5 40	8 54	11 20	4 39	21 20	2 25	38 0	1 13
0 45	26 20	5 45	8 47	11 30	4 34	21 30	2 24	38 30	1 11
0 50	25 42	5 50	8 41	11 40	4 31	21 40	2 23	39 0	1 10
0 55	25 5	5 55	8 34	11 50	4 27	21 50	2 21	39 30	1 9
1 0	24 29	6 0	8 28	12 0	4 23	22 0	2 20	40 0	1 8
1 5	23 54	6 5	8 21	12 10	4 20	22 10	2 19	41 0	1 5
1 10	23 20	6 10	8 15	12 20	4 16	22 20	2 18	42 0	1 3
1 15	22 47	6 15	8 9	12 30	4 13	22 30	2 17	43 0	1 1
1 20	22 15	6 20	8 3	12 40	4 9	22 40	2 16	44 0	0 59
1 25	21 44	6 25	7 57	12 50	4 6	22 50	2 15	45 0	0 57
1 30	21 15	6 30	7 51	13 0	4 3	23 0	2 14	46 0	0 55
1 35	20 46	6 35	7 45	13 10	4 0	23 10	2 13	47 0	0 53
1 40	20 18	6 40	7 40	13 20	3 57	23 20	2 12	48 0	0 51
1 45	19 51	6 45	7 35	13 30	3 54	23 30	2 11	49 0	0 49
1 50	19 25	6 50	7 30	13 40	3 51	23 40	2 10	50 0	0 48
1 55	19 0	6 55	7 25	13 50	3 48	23 50	2 9	51 0	0 46
2 0	18 35	7 0	7 20	14 0	3 45	24 0	2 8	52 0	0 44
2 5	18 11	7 5	7 15	14 10	3 43	24 10	2 7	53 0	0 43
2 10	17 48	7 10	7 11	14 20	3 40	24 20	2 6	54 0	0 41
2 15	17 26	7 15	7 6	14 30	3 38	24 30	2 5	55 0	0 40
2 20	17 4	7 20	7 2	14 40	3 35	24 40	2 4	56 0	0 38
2 25	16 44	7 25	6 57	14 50	3 33	24 50	2 3	57 0	0 37
2 30	16 24	7 30	6 53	15 0	3 30	25 0	2 2	58 0	0 35
2 35	16 4	7 35	6 49	15 10	3 28	25 10	2 1	59 0	0 34
2 40	15 45	7 40	6 45	15 20	3 26	25 20	2 0	60 0	0 33
2 45	15 27	7 45	6 41	15 30	3 24	25 30	1 59	61 0	0 32
2 50	15 9	7 50	6 37	15 40	3 21	25 40	1 58	62 0	0 30
2 55	14 52	7 55	6 33	15 50	3 19	25 50	1 57	63 0	0 29
3 0	14 36	8 0	6 29	16 0	3 17	26 0	1 56	64 0	0 28
3 5	14 20	8 5	6 25	16 10	3 15	26 10	1 55	65 0	0 26
3 10	14 4	8 10	6 22	16 20	3 12	26 20	1 55	66 0	0 25
3 15	13 49	8 15	6 18	16 30	3 10	26 30	1 54	67 0	0 24
3 20	13 34	8 20	6 15	16 40	3 8	26 40	1 53	68 0	0 23
3 25	13 20	8 25	6 11	16 50	3 6	26 50	1 52	69 0	0 22
3 30	13 6	8 30	6 8	17 0	3 4	27 0	1 51	70 0	0 21
3 35	12 53	8 35	6 5	17 10	3 3	27 15	1 50	71 0	0 19
3 40	12 40	8 40	6 1	17 20	3 1	27 30	1 49	72 0	0 18
3 45	12 27	8 45	5 58	17 30	2 59	27 45	1 48	73 0	0 17
3 50	12 15	8 50	5 55	17 40	2 57	28 0	1 47	74 0	0 16
3 55	12 3	8 55	5 52	17 50	2 55	28 15	1 46	75 0	0 15
4 0	11 51	9 0	5 48	18 0	2 54	28 30	1 45	76 0	0 14
4 5	11 40	9 5	5 45	18 10	2 52	28 45	1 44	77 0	0 13
4 10	11 29	9 10	5 42	18 20	2 51	29 0	1 42	78 0	0 12
4 15	11 18	9 15	5 39	18 30	2 49	29 30	1 40	79 0	0 11
4 20	11 8	9 20	5 36	18 40	2 47	30 0	1 38	80 0	0 10
4 25	10 58	9 25	5 34	18 50	2 46	30 30	1 37	81 0	0 9
4 30	10 48	9 30	5 31	19 0	2 44	31 0	1 35	82 0	0 8
4 35	10 39	9 35	5 28	19 10	2 43	31 30	1 33	83 0	0 7
4 40	10 29	9 40	5 25	19 20	2 41	32 0	1 31	84 0	0 6
4 45	10 20	9 45	5 23	19 30	2 40	32 30	1 30	86 0	0 4
4 50	10 11	9 50	5 20	19 40	2 38	33 0	1 28	88 0	0 2
4 55	10 2	9 55	5 18	19 50	2 37	33 30	1 26	90 0	0 0

TABLE V.

Dip of the Horizon.

Height	Dip.
Feet	′ ″
1	0 58
2	1 21
3	1 40
4	1 56
5	2 9
6	2 21
7	2 33
8	2 44
9	2 53
10	3 2
11	3 10
12	3 19
13	3 27
14	3 36
15	3 42
16	3 50
17	3 57
18	4 4
19	4 11
20	4 17
21	4 23
22	4 30
23	4 36
24	4 42
26	4 52
28	5 5
30	5 15
35	5 39
40	6 4
45	6 27
50	6 46
60	7 25
70	8 1
80	8 34
90	9 6
100	9 35

TABLE VI.

Sun's Parallax in Alt.

Altit.	Parall.
°	″
0	9
10	9
20	8
30	8
40	7
50	6
55	5
60	4
65	4
70	3
75	2
80	2
85	1
90	0

TAB. VII.

Moon's Augmentat.

Alt.	Augm.
°	″
0	⊙
5	1
10	3
15	4
20	6
25	7
30	8
35	9
40	10
45	11
50	12
55	13
60	14
70	15
80	15
90	16

TABLE VIII.

Dip at differ. Distances from the Observer.

Miles.	Height of the Eye in Feet.					
	5	10	15	20	25	30
	11′	23′	34′	45′	57′	68′
	6	12	17	23	28	34
	4	8	12	15	19	23
1	3	6	9	12	15	17
1¼	3	5	7	10	12	14
1½	3	4	6	8	10	12
2	2	4	5	7	8	9
2½	2	3	4	6	7	8
3	2	3	4	5	6	7
3½	2	3	4	5	6	6
4	2	3	4	5	5	6
5	2	3	4	4	5	6
6	2	3	4	4	5	5

For correcting the OBSERVED ALTITUDE of the SUN'S LOWER LIMB, when taken by a Fore Observation.

Obs. Alt.	Height of the Eye above the Sea in Feet.															
	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
5° 0′	3′.8	3′.5	3′.1	2′.8	2′.5	2′.3	2′.1	1′.8	1′.6	1′.4	1′.2	1′.0	0′.8	0′.6	0′.5	0′.3
5 20	4.3	4.0	3.6	3.3	3.1	2 8	2.6	2.3	2.1	1.9	1.7	1.5	1.3	1.1	1.0	0.8
5 40	4.8	4.5	4.1	3.8	3.5	3.3	3.1	2.8	2.6	2.4	2.2	2.0	1.8	1.6	1.5	1.3
6 0	5.3	4.9	4.6	4.3	4.0	3.7	3.5	3.3	3.0	2.8	2.6	2.4	2.2	2.1	1.9	1.7
6 20	5.7	5.4	5.0	4.7	4.4	4.1	3.9	3.7	3.3	3.2	3.0	2.8	2.6	2.5	2.3	2.0
6 40	6.0	5.7	5.3	5.0	4.7	4.5	4.3	4.0	3.8	3.6	3.4	3.2	3.0	2.8	2.7	2.3
7 0	6.4	6.0	5.7	5.4	5.1	4.8	4.6	4.4	4.1	3.9	3.7	3.5	3.3	3.2	3.0	2.7
7 20	6.7	6.3	6.0	5.7	5.4	5.1	4.9	4.7	4.4	4.2	4.0	3.8	3.6	3.5	3.3	3.1
7 40	6.9	6.6	6.2	5.9	5.7	5.4	5.2	4.9	4.7	4.5	4.3	4.1	3.9	3.8	3.6	3.4
8 0	7.2	6.8	6.5	6.2	5.9	5.7	5.4	5.3	5.0	4.8	4.6	4.4	4.2	4.0	3.9	3.7
8 20	7.5	7.1	6.7	6.5	6.2	5.9	5.7	5.5	5.2	5.0	4.8	4.6	4.4	4.3	4.1	2.9
8 40	7.7	7.3	7.0	6.7	6.4	6.1	5.9	5.7	5.5	5.2	5.0	4.8	4.7	4.5	4.3	4.1
9 0	7.9	7.5	7.2	6.9	6.6	6.4	6.1	5.9	5.7	5.5	5.3	5.1	4.9	4.7	4.5	4.4
9 20	8.1	7.7	7.4	7.1	6 8	6.6	6.3	6.1	5.9	5.7	5.5	5.3	5.1	4.9	4.7	4.6
9 40	8.3	7.9	7.6	7.3	7.0	6.7	6.5	6.3	6.1	5.8	5.6	5.4	5.3	5.1	4.9	4.7
10 0	8.5	8.1	7.8	7.5	7.2	6.9	6.7	6.5	6.2	6 0	5.8	5.6	5.4	5.3	5.1	4.9
10 30	8.7	8.3	8.0	7.7	7.4	7 2	6.9	6.7	6.5	6.3	6.1	5.9	5.7	5.5	5.4	5.2
11 0	8.9	8.6	8.2	7.9	7.6	7.4	7.2	6.9	6.7	6.5	6.3	6.1	5.9	5.7	5.6	5.4
11 30	9.1	8.8	8.4	8.1	7.8	7.6	7.4	7.1	6.9	6.7	6.5	6.3	6.1	5.9	5.8	5.6
12 0	9.3	9.0	8.7	8.3	8.0	7.8	7.6	7.3	7.1	6.9	6.7	6.5	6.3	6.2	6.0	5 8
13 0	9.6	9.3	9.0	8.7	8.4	8.1	7.9	7.7	7.4	7.2	7.0	6.8	6.6	6.5	6.3	6.1
14 0	9.9	9.6	9.2	8.9	8.7	8.4	8.2	7.9	7.7	7.5	7.3	7.1	6.9	6.8	6.6	6.4
15 0	10.2	9.8	9.5	9.2	8.9	8.7	8.4	8.2	8.0	7.8	7.6	7.4	7.2	7.0	6.9	6.7
16 0	10.4	10.1	9.7	9.4	9.1	8.9	8.7	8.4	8.2	8.0	7.8	7.6	7.4	7.2	7.1	6.9
17 0	10.6	10.3	9.9	9.6	9.3	9.1	8.9	8.6	8.3	8.2	8.0	7.8	7.6	7.4	7.3	7.1
18 0	10.8	10.4	10.1	9.8	9.5	9.3	9.0	8 8	8.6	8.4	8.2	8.0	7.8	7.6	7.5	7.3
19 0	11.0	10.6	10.3	10.0	9.7	9.4	9.2	9.0	8.8	8.5	8.3	8.1	8.0	7.8	7.6	7.4
20 0	11.1	10.7	10.4	10.1	9.8	9.6	9 3	9.1	8.9	8.7	8.5	8.2	8.1	7.9	7.7	7.6
21 0	11.2	10.9	10.5	10.2	10.0	9.7	9.5	9.2	9.0	8.8	8.6	8.4	8.2	8.1	7.9	7.7
22 0	11.4	11.0	10.7	10.4	10.1	9.8	9 6	9.4	9.1	8.9	8.7	8.5	8.3	8.2	8 0	7.8
23 0	11.5	11 1	10.8	10.5	10.2	9 9	9.7	9.5	9.2	9.0	8.8	8.6	8.4	8 3	8.1	7.9
24 0	11.6	11.2	10.9	10.6	10.3	10.0	9.8	9.6	9.3	9.1	8.9	8.7	8.5	8.4	8.2	8.0
25 0	11.7	11.3	11.0	10.7	10.4	10.1	9.9	9.7	9.4	9.2	9.0	8.8	8.6	8.5	8.3	8.1
26 0	11.7	11.4	11.0	10.7	10.5	10.2	10.0	9 7	9.5	9.3	9.1	8.9	8.7	8.6	8.4	8.2
27 0	11.8	11.5	11.1	10.8	10.5	10.3	10.1	9.8	9.6	9.4	9.2	9.0	8.8	8.6	8.5	8.3
28 0	11.9	11.6	11.2	10.9	10.6	10.4	10.2	9.9	9.7	9.5	9.3	9.1	8.9	8.7	8.5	8.4
30 0	12.0	11.7	11.3	11.0	10.8	10.5	10.3	10.0	9.8	9.6	9.4	9.2	9.0	8.9	8.7	8.5
32 0	12.2	11.8	11.5	11.2	10.9	10.6	10.4	10.2	9.9	9.7	9.5	9.3	9.1	9.0	8.8	8.6
34 0	12.3	11.9	11.6	11.3	11.0	10.7	10 5	10.3	10.1	9.9	9.6	9.4	9.2	9.1	8.9	8.7
36 0	12.4	12.0	11.7	11.4	11.1	10.8	10.6	10.4	10.2	9.9	9.7	9.5	9.3	9.2	9.0	8 8
38 0	12.5	12.1	11.8	11.5	11.2	10.9	10.7	10.5	10.2	10.0	9.8	9.6	9.4	9.3	9.1	8.9
40 0	12.5	12.2	11.8	11.5	11.3	11.0	10.8	10.5	10.3	10.1	9.9	9.7	9.5	9.4	9.2	9.0
42 0	12.6	12.2	11.9	11.6	11.3	11.1	10.8	10.6	10.4	10.2	10.0	9.8	9.6	9.4	9.3	9.1
44 0	12.7	12.3	12.0	11.7	11.4	11.1	10.9	10.7	10.5	10.2	10.1	9.8	9.7	9.5	9.3	9.1
46 0	12.7	12.4	12.0	11.7	11.5	11.2	11.0	10.7	10.5	10.3	10.2	9.9	9.7	9.6	9.4	9.2
48 0	12.8	12.4	12.1	11.8	11.5	11.3	11.0	10.8	10.6	10.4	10.2	10.0	9.8	9.6	9 5	9.3
50 0	12.8	12.5	12.2	11.9	11.6	11.3	11.1	10.9	10.6	10.4	10.3	10.0	9.8	9.7	9.5	9.3
52 0	12.9	12.5	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5	10.3	10.1	9.9	9.7	9.6	9.4
54 0	13.0	12.6	12.3	12.0	11.7	11.4	11.2	11.0	10.7	10.5	10.3	10.1	9.9	9.8	9.6	9.4
56 0	13.0	12.6	12.3	12.0	11.7	11.5	11.2	11.0	10.8	10.6	10.4	10.2	10.0	9.8	9.7	9.5
58 0	13.0	12.7	12.3	12.0	11.7	11.5	11.3	11.0	10.8	10.6	10.4	10.2	10.0	9 9	9.7	9.5
60 0	13.1	12.7	12.4	12.1	11.8	11.6	11.3	11.1	10.9	10.6	10.4	10.2	10.1	9.9	9.7	9.5
62 0	13.1	12.8	12.4	12.1	11.8	11.6	11.4	11.1	10.9	10.7	10.5	10.3	10.1	9.9	9.8	9.6
64 0	13.2	12.8	12.5	12.2	11.9	11.6	11.4	11.2	10.9	10.7	10.5	10.3	10.1	10.0	9.8	9.6
66 0	13.2	12.8	12.5	12.2	11.9	11.7	11.4	11.2	11.0	10.8	10.6	10.4	10.2	10.0	9.8	9.7
70 0	13.3	12.9	12.6	12.3	12.0	11.8	11.5	11.3	11.0	10.8	10.6	10.4	10.2	10.1	9.9	9.7
80 0	13.4	13.1	12.7	12.4	12.1	11.9	11.7	11.4	11.2	11.0	10.8	10.6	10.4	10.2	10.1	9.9
90 0	13.6	13.2	12.9	12 6	12.3	12 0	11.8	11.6	11.3	11.1	10.9	10.7	10.5	10.4	10.2	10.0

Month,	Jan.	Feb.	Mar.	April,	May,	June,	July,	Aug.	Sept.	Oct.	Nov.	Dec.
Correction,	+0′.3	+0′.2	+0′.1	0′.0	−0′.2	−0′.2	−0′.3	−0′.2	−0′.1	+0′.1	+0′.2	+0′.3

TABLE X.

Sun's Declination for the Years 1876, 1880, 1884, 1888, &c.

Days.	Jan.	Feb.	March.	April	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Days.
	South.	South.	South.	North.	North.	North.	North.	North.	North.	South.	South.	South.	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
1	23 3	17 12	7 20 S.	4 47	15 16	22 9	23 5	17 53	8 4 N.	3 25	14 39	21 55	1
2	22 58	16 55	6 57	5 11	15 34	22 17	23 1	17 38	7 43	3 49	14 58	22 4	2
3	22 52	16 37	6 34	5 33	15 52	22 24	22 56	17 22	7 20	4 12	15 16	22 13	3
4	22 46	16 19	6 11	5 56	16 9	22 31	22 51	17 6	6 58	4 35	15 35	22 21	4
5	22 40	16 1	5 48	6 19	16 26	22 37	22 45	16 50	6 36	4 58	15 53	22 28	5
6	22 33	15 43	5 24	6 42	16 43	22 44	22 39	16 33	6 14	5 21	16 11	22 35	6
7	22 26	15 25	5 1	7 4	16 59	22 49	22 32	16 16	5 51	5 44	16 29	22 42	7
8	22 18	15 6	4 38	7 27	17 16	22 55	22 26	15 59	5 29	6 7	16 46	22 48	8
9	22 10	14 47	4 14	7 49	17 32	23 0	22 18	15 42	5 6	6 30	17 3	22 54	9
10	22 1	14 27	3 51	8 11	17 47	23 4	22 11	15 24	4 43	6 53	17 20	22 59	10
11	21 52	14 8	3 27	8 33	18 3	23 8	22 3	15 7	4 20	7 15	17 37	23 4	11
12	21 42	13 48	3 4	8 55	18 18	23 12	21 54	14 49	3 57	7 38	17 53	23 9	12
13	21 33	13 28	2 40	9 17	18 32	23 16	21 46	14 30	3 34	8 0	18 9	23 13	13
14	21 22	13 8	2 16	9 38	18 47	23 18	21 37	14 12	3 11	8 23	18 24	23 16	14
15	21 12	12 47	1 53	10 0	19 1	23 21	21 27	13 53	2 48	8 45	18 40	23 19	15
16	21 0	12 27	1 29	10 21	19 15	23 23	21 17	13 34	2 25	9 7	18 55	23 22	16
17	20 49	12 6	1 5	10 42	19 28	23 25	21 7	13 15	2 2	9 29	19 9	23 24	17
18	20 37	11 45	0 42	11 3	19 42	23 26	20 56	12 55	1 38	9 51	19 24	23 25	18
19	20 25	11 24	0 18 S.	11 24	19 54	23 27	20 46	12 35	1 15	10 13	19 38	23 27	19
20	20 12	11 2	0 6 N.	11 44	20 7	23 27	20 34	12 16	0 52	10 34	19 51	23 27	20
21	19 59	10 41	0 30	12 4	20 19	23 27	20 23	11 56	0 28	10 56	20 4	23 27	21
22	19 45	10 19	0 53	12 25	20 31	23 27	20 11	11 36	0 5 N.	11 17	20 17	23 27	22
23	19 32	9 57	1 17	12 45	20 42	23 26	19 58	11 15	0 18 S.	11 38	20 30	23 26	23
24	19 17	9 35	1 40	13 4	20 53	23 25	19 46	10 55	0 42	11 59	20 42	23 25	24
25	19 3	9 13	2 4	13 24	21 4	23 23	19 33	10 34	1 5	12 19	20 53	23 24	25
26	18 48	8 50	2 28	13 43	21 14	23 21	19 19	10 13	1 29	12 40	21 5	23 21	26
27	18 33	8 28	2 51	14 2	21 24	23 19	19 6	9 52	1 52	13 0	21 16	23 19	27
28	18 17	8 5	3 15	14 21	21 34	23 16	18 52	9 31	2 15	13 20	21 26	23 16	28
29	18 1	7 43	3 38	14 40	21 43	23 13	18 38	9 9	2 39	13 40	21 36	23 12	29
30	17 45		4 1	14 58	21 52	23 9	18 23	8 48	3 2 S.	14 0	21 46	23 8	30
31	17 29		4 27 N.		22 1		18 8	8 26		14 19		23 4	31

TABLE XI To correct the Sun's Declination.

When Declin. is increasing, { add in W. Long. / sub. in E. Long. }

When Declin. is decreasing, { sub. in W. Long. / add in E. Long. }

Long.	SUN'S DECLINATION.																								Long.
	° 0	° 1	° 2	° 3	° 4	° 5	° 6	° 7	° 8	° 9	° 10	° 11	° 12	° 13	° 14	° 15	° 16	° 17	° 18	° 19	° 20	° 21	° 22	° 23	° 23½	
°	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	°
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	10
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	20
30	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	0	30
40	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	0	40
50	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	1	1	1	0	50
60	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	2	2	2	1	1	0	60
70	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	2	2	2	1	0	70
80	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	3	3	3	2	2	1	0	80
90	6	6	6	6	6	6	6	6	6	6	5	5	5	5	5	4	4	4	4	3	3	2	1	1	0	90
100	7	7	6	6	6	6	6	6	6	6	6	6	6	6	5	5	5	5	4	4	4	3	2	1	0	100
110	7	7	7	7	7	7	7	7	7	7	7	6	6	6	6	6	5	5	5	4	4	3	3	1	0	110
120	8	8	8	8	8	8	8	7	7	7	7	7	7	7	6	6	6	6	5	5	4	4	3	2	0	120
130	9	8	8	8	8	8	8	8	8	8	8	8	7	7	7	7	6	6	6	5	5	4	3	2	0	130
140	9	9	9	9	9	9	9	9	9	9	8	8	8	8	7	7	7	6	6	6	5	4	3	2	0	140
150	10	10	10	10	10	10	10	9	9	9	9	9	9	8	8	8	7	7	6	6	5	5	4	2	0	150
160	10	10	10	10	10	10	10	10	10	10	10	9	9	9	9	8	8	7	7	6	6	5	4	2	0	160
170	11	11	11	11	11	11	11	10	10	10	10	10	10	9	9	9	8	8	7	7	6	5	4	2	0	170
180	12	12	12	12	12	12	11	11	11	11	11	11	10	10	10	9	9	8	8	7	6	5	4	2	0	180

TABLE X.

Sun's Declination for the Years 1879, 1883, 1887, 1891, &c.

Days.	Jan.	Feb.	March.	April	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Days.
	South.	South.	South.	North.	North.	North.	North.	North.	North.	South.	South.	South.	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
1	23 1	17 7	7 36 S.	4 31	15 3	22 3	23 8	18 4	8 20 N.	3 9	14 25	21 48	1
2	22 56	16 50	7 14	4 54	15 21	22 11	23 4	17 49	7 58	3 32	14 44	21 58	2
3	22 50	16 32	6 51	5 17	15 39	22 19	22 59	17 33	7 36	3 55	15 3	22 6	3
4	22 44	16 14	6 28	5 40	15 56	22 26	22 54	17 17	7 14	4 18	15 21	22 15	4
5	22 38	15 56	6 5	6 3	16 14	22 33	22 49	17 1	6 52	4 42	15 40	22 23	5
6	22 31	15 38	5 41	6 25	16 31	22 39	22 43	16 45	6 30	5 5	15 58	22 30	6
7	22 23	15 19	5 18	6 48	16 47	22 45	22 37	16 28	6 7	5 28	16 16	22 37	7
8	22 16	15 1	4 55	7 10	17 4	22 51	22 30	16 12	5 45	5 51	16 33	22 44	8
9	22 7	14 41	4 31	7 33	17 20	22 56	22 23	15 54	5 22	6 14	16 51	22 50	9
10	21 58	14 22	4 8	7 55	17 36	23 1	22 16	15 37	4 59	6 36	17 8	22 55	10
11	21 49	14 2	3 44	8 17	17 51	23 5	22 8	15 19	4 37	6 59	17 25	23 1	11
12	21 40	13 43	3 21	8 39	18 7	23 9	22 0	15 1	4 14	7 22	17 41	23 5	12
13	21 30	13 23	2 57	9 1	18 22	23 13	21 52	14 43	3 51	7 44	17 57	23 10	13
14	21 19	13 2	2 33	9 23	18 36	23 16	21 43	14 25	3 28	8 7	18 13	23 13	14
15	21 8	12 42	2 10	9 44	18 51	23 19	21 33	14 6	3 5	8 29	18 29	23 17	15
16	20 57	12 21	1 46	10 6	19 5	23 22	21 24	13 48	2 41	8 51	18 44	23 20	16
17	20 46	12 0	1 22	10 27	19 19	23 24	21 14	13 28	2 18	9 18	18 59	23 22	17
18	20 34	11 39	0 59	10 48	19 32	23 25	21 4	13 9	1 55	9 35	19 13	23 24	18
19	20 21	11 18	0 35	11 9	19 45	23 26	20 53	12 50	1 32	9 57	19 27	23 26	19
20	20 8	10 56	0 11 S.	11 29	19 58	23 27	20 42	12 30	1 8	10 19	19 41	23 27	20
21	19 55	10 35	0 12 N.	11 50	20 10	23 27	20 31	12 10	0 45	10 40	19 55	23 27	21
22	19 42	10 13	0 36	12 10	20 22	23 27	20 19	11 50	0 22 N.	11 2	20 8	23 27	22
23	19 28	9 51	1 0	12 30	20 34	23 27	20 7	11 30	0 2 S.	11 23	20 21	23 27	23
24	19 13	9 29	1 23	12 50	20 45	23 26	19 55	11 9	0 25	11 44	20 33	23 26	24
25	18 59	9 7	1 47	13 10	20 56	23 25	19 42	10 49	0 48	12 5	20 45	23 25	25
26	18 44	8 44	2 11	13 29	21 7	23 23	19 29	10 28	1 12	12 25	20 56	23 23	26
27	18 28	8 22	2 34	13 48	21 17	23 21	19 16	10 7	1 35	12 46	21 8	23 21	27
28	18 13	7 59	2 58	14 7	21 27	23 18	19 2	9 46	1 59	13 6	21 18	23 18	28
29	17 57		3 21	14 26	21 37	23 15	18 48	9 25	2 12	13 26	21 29	23 15	29
30	17 41		3 44	14 45	21 46	23 12	18 34	9 3	2 45 S.	13 46	21 39	23 11	30
31	17 24		4 8 N.		21 55		18 19	8 42		14 5		23 7	31

TABLE XI. To correct the Sun's Declination.

When Declin. is increasing, { add in W. Long. / sub. in E. Long. }

When Declin. is decreasing, { sub. in W. Long. / add in E. Long. }

Long.	SUN'S DECLINATION.																							Long.
	° 0	° 1	° 2	° 3	° 4	° 5	° 6	° 7	° 8	° 9	° 10	° 11	° 12	° 13	° 14	° 15	° 16	° 17	° 18	° 19	° 20	° 21	° 22	° 23	° 23½	
°	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	°
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	10
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	20
30	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	0	30
40	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	0	40
50	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	1	1	1	0	50
60	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	2	2	2	1	1	0	60
70	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	2	2	2	1	0	70
80	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	3	3	3	2	2	1	0	80
90	6	6	6	6	6	6	6	6	6	6	5	5	5	5	5	5	4	4	4	4	3	3	2	1	0	90
100	7	7	6	6	6	6	6	6	6	6	6	6	6	6	5	5	5	5	4	4	4	3	2	1	0	100
110	7	7	7	7	7	7	7	7	7	7	7	6	6	6	6	6	5	5	5	4	4	3	3	1	0	110
120	8	8	8	8	8	8	8	7	7	7	7	7	7	7	6	6	6	6	5	5	4	4	3	2	0	120
130	9	8	8	8	8	8	8	8	8	8	8	8	8	7	7	7	6	6	6	5	5	4	3	2	0	130
140	9	9	9	9	9	9	9	9	9	9	8	8	8	8	8	7	7	7	6	6	6	5	4	3	2	0	140
150	10	10	10	10	10	10	10	9	9	9	9	9	9	8	8	8	7	7	6	6	5	5	4	2	0	150
160	10	10	10	10	10	10	10	10	10	10	10	9	9	9	9	8	8	7	7	6	6	5	4	2	0	160
170	11	11	11	11	11	11	11	10	10	10	10	10	10	9	9	9	8	8	7	7	6	5	4	2	0	170
180	12	12	12	12	12	12	11	11	11	11	11	11	10	10	10	9	9	8	8	7	6	5	4	2	0	180

TABLE X.

Sun's Declination for the Years 1877, 1881, 1885, 1889, &c.

Days.	Jan.	Feb.	March.	April	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Days.
	South.	South.	South.	North.	North.	North.	North.	North.	North.	South.	South.	South.	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
1	22 59	16 59	7 25 S.	4 42	15 12	22 7	23 7	17 57	8 10 N.	3 20	14 34	21 53	1
2	22 53	16 41	7 2	5 5	15 36	22 15	23 2	17 42	7 48	3 43	14 53	22 2	2
3	22 48	16 24	6 39	5 28	15 47	22 22	22 57	17 26	7 26	4 6	15 12	22 11	3
4	22 41	16 6	6 16	5 51	16 5	22 29	22 52	17 10	7 4	4 30	15 30	22 19	4
5	22 35	15 48	5 53	6 14	16 22	22 36	22 46	16 54	6 41	4 53	15 49	22 26	5
6	22 27	15 29	5 30	6 36	16 39	22 42	22 40	16 37	6 19	5 16	16 7	22 34	6
7	22 19	15 10	5 7	6 59	16 55	22 48	22 34	16 21	5 57	5 39	16 24	22 40	7
8	22 12	14 51	4 43	7 21	17 12	22 53	22 27	16 4	5 34	6 2	16 42	22 47	8
9	22 3	14 32	4 20	7 44	17 28	22 58	22 20	15 46	5 11	6 25	16 59	22 53	9
10	21 54	14 13	3 56	8 6	17 43	23 3	22 13	15 29	4 49	6 47	17 16	22 58	10
11	21 45	13 53	3 33	8 28	17 59	23 7	22 5	15 11	4 26	7 10	17 33	23 3	11
12	21 35	13 33	3 9	8 50	18 14	23 11	21 56	14 53	4 3	7 33	17 49	23 8	12
13	21 25	13 13	2 46	9 11	18 29	23 15	21 48	14 35	3 40	7 55	18 5	23 12	13
14	21 14	12 52	2 22	9 33	18 43	23 18	21 39	14 16	3 17	8 17	18 21	23 15	14
15	21 3	12 32	1 58	9 55	18 58	23 20	21 29	13 57	2 54	8 40	18 36	23 18	15
16	20 52	12 11	1 35	10 16	19 12	23 23	21 20	13 38	2 30	9 2	18 51	23 21	16
17	20 40	11 50	1 11	10 37	19 25	23 24	21 9	13 19	2 7	9 24	19 6	23 23	17
18	20 28	11 29	0 47	10 58	19 38	23 26	20 59	13 0	1 44	9 46	19 20	23 25	18
19	20 15	11 7	0 23 S.	11 19	19 51	23 27	20 48	12 40	1 21	10 7	19 34	23 26	19
20	20 2	10 46	0 0 N.	11 39	20 4	23 27	20 37	12 21	0 57	10 29	19 48	23 27	20
21	19 49	10 24	0 24 N.	12 0	20 16	23 27	20 25	12 1	0 34	10 50	20 1	23 27	21
22	19 35	10 2	0 48	12 20	20 28	23 27	20 14	11 41	0 11 N.	11 12	20 14	23 27	22
23	19 21	9 40	1 11	12 40	20 39	23 26	20 1	11 20	0 12 S.	11 33	20 27	23 27	23
24	19 6	9 18	1 35	13 0	20 51	23 25	19 49	11 0	0 36	11 54	20 39	23 26	24
25	18 51	8 56	1 59	13 19	21 1	23 24	19 36	10 39	1 0	12 14	20 51	23 24	25
26	18 36	8 33	2 22	13 39	21 12	23 22	19 23	10 18	1 23	12 35	21 2	23 22	26
27	18 21	8 11	2 45	13 58	21 22	23 20	19 9	9 51	1 46	12 55	21 13	23 20	27
28	18 5	7 48	3 9	14 17	21 32	23 17	18 55	9 36	2 10	13 15	21 24	23 17	28
29	17 49		3 32	14 35	21 41	23 14	18 41	9 15	2 33	13 35	21 34	23 13	29
30	17 32		3 56	14 54	21 50	23 10	18 27	8 53	2 56 S.	13 55	21 44	23 9	30
31	17 16		4 19 N.		21 59		18 12	8 32		14 15		23 5	31

TABLE XII.

To correct the Sun's Declination for the Changes in Periods of Four Years.

Periods of Years.	MONTHS.															Periods of Years.
	January.					February.					March.					
	Days.					Days.					Days.					
	1	7	13	19	25	1	7	13	19	25	1	7	13	19	25	
	sub.	sub.	sub.	sub.	sub.	sub.	sub.	sub.	sub.	sub.	sub.	sub.	sub.	sub.	add.	
	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	
4	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	4
8	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	8
12	0	1	1	1	1	1	2	2	2	2	2	2	2	2	2	12
16	1	1	1	1	2	2	2	2	2	3	3	3	3	3	3	16
20	1	1	1	2	2	2	3	3	3	3	3	3	3	4	4	20
	April.					May.					June.					
	Days.					Days.					Days.					
	1	7	13	19	25	1	7	13	19	25	1	7	13	19	25	
	add.	add.	add.	add.	add.	add.	add.	add.	add.	add.	add.	add.	add.			
	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	
4	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	4
8	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	8
12	2	2	2	2	2	2	2	1	1	1	1	1	0	0	0	12
16	*3*	*3*	3	3	2	2	2	2	2	1	1	1	0	0	0	16
20	*4*	*3*	*3*	3	3	3	3	2	2	2	1	1	1	0	0	20

TABLE X.

Sun's Declination for the Years 1878, 1882, 1886, 1890, &c.

Days.	Jan.	Feb.	March.	April	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Days.
	South.	South.	South.	North.	North.	North.	North.	North.	North.	South.	South.	South.	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
1	23 0	17 3	7 31 S.	4 36	15 7	22 5	23 7	18 0	8 15 N.	3 14	14 29	21 51	1
2	22 55	16 46	7 8	4 59	15 25	22 13	23 3	17 45	7 53	3 38	14 48	22 0	2
3	22 49	16 28	6 45	5 22	15 43	22 20	22 58	17 29	7 31	4 1	15 7	22 8	3
4	22 43	16 10	6 22	5 45	16 1	22 28	22 53	17 14	7 9	4 24	15 26	22 17	4
5	22 36	15 52	5 59	6 8	16 18	22 34	22 48	16 57	6 47	4 47	15 44	22 24	5
6	22 29	15 34	5 36	6 31	16 35	22 41	22 42	16 41	6 24	5 10	16 2	22 32	6
7	22 22	15 15	5 12	6 53	16 51	22 47	22 36	16 24	6 2	5 33	16 20	22 39	7
8	22 14	14 56	4 49	7 16	17 8	22 52	22 29	16 7	5 39	5 56	16 38	22 45	8
9	22 5	14 37	4 26	7 38	17 24	22 57	22 22	15 50	5 17	6 19	16 55	22 51	9
10	21 56	14 17	4 2	8 0	17 40	23 2	22 14	15 33	4 54	6 42	17 12	22 57	10
11	21 47	13 58	3 38	8 23	17 55	23 6	22 7	15 15	4 31	7 5	17 29	23 2	11
12	21 37	13 38	3 15	8 44	18 10	23 10	21 58	14 57	4 8	7 27	17 45	23 6	12
13	21 27	13 18	2 51	9 6	18 25	23 14	21 50	14 39	3 45	7 50	18 1	23 11	13
14	21 17	12 57	2 28	9 28	18 40	23 17	21 41	14 21	3 22	8 12	18 17	23 14	14
15	21 6	12 37	2 4	9 49	18 54	23 20	21 32	14 2	2 59	8 34	18 32	23 18	15
16	20 54	12 16	1 40	10 11	19 8	23 22	21 22	13 43	2 36	8 57	18 47	23 20	16
17	20 43	11 55	1 17	10 32	19 22	23 24	21 12	13 24	2 13	9 19	19 2	23 23	17
18	20 31	11 34	0 53	10 53	19 35	23 25	21 1	13 5	1 50	9 40	19 17	23 25	18
19	20 18	11 13	0 29	11 14	19 48	23 27	20 51	12 45	1 26	10 2	19 31	23 26	19
20	20 5	10 51	0 6 S.	11 34	20 1	23 27	20 40	12 25	1 3	10 24	19 45	23 27	20
21	19 52	10 29	0 18 N.	11 55	20 13	23 27	20 28	12 5	0 40	10 45	19 58	23 27	21
22	19 38	10 8	0 42	12 15	20 25	23 27	20 16	11 45	0 16 N.	11 7	20 11	23 27	22
23	19 24	9 46	1 5	12 35	20 37	23 27	20 4	11 25	0 7 S.	11 28	20 24	23 27	23
24	19 10	9 24	1 29	12 55	20 48	23 26	19 52	11 5	0 31	11 48	20 36	23 26	24
25	18 55	9 1	1 53	13 14	20 59	23 24	19 39	10 44	0 54	12 10	20 48	23 24	25
26	18 40	8 39	2 16	13 34	21 9	23 22	19 26	10 23	1 18	12 30	20 59	23 22	26
27	18 25	8 16	2 40	13 53	21 20	23 20	19 12	10 2	1 41	12 51	21 10	23 20	27
28	18 9	7 54	3 3	14 12	21 29	23 18	18 59	9 41	2 4	13 11	21 21	23 17	28
29	17 53		3 27	14 31	21 39	23 14	18 44	9 20	2 28	13 31	21 31	23 14	29
30	17 37		3 50	14 49	21 48	23 11	18 30	8 58	2 51 S.	13 51	21 41	23 10	30
31	17 20		4 13 N.		21 57		18 15	8 37		14 10		23 6	31

TABLE XII.

To correct the Sun's Declination for the Changes in Periods of Four Years.

Periods of Years.	MONTHS.															Periods of Years.
	July.					August.					September.					
	Days.					Days.					Days.					
	1	7	13	19	25	1	7	13	19	25	1	7	13	19	25	
	sub. ′	sub. ′	sub. ′	sub. ′	sub. ′	sub. ′	sub. ′	sub. ′	sub. ′	sub. ′	sub. ′	sub. ′	sub. ′	sub. ′	add. ′	
4	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	4
8	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	8
12	0	1	1	1	1	1	2	2	2	2	2	2	2	2	2	12
16	0	1	1	1	2	2	2	2	2	3	3	3	3	3	3	16
20	1	1	1	2	2	2	2	3	3	3	3	3	3	4	4	20
	October.					November.					December.					
	Days.					Days.					Days.					
	1	7	13	19	25	1	7	13	19	25	1	7	13	19	25	
	add. ′	add. ′	add. ′	add. ′	add. ′	add. ′	add. ′	add. ′	add. ′	add. ′	add. ′	add. ′	add. ′	′	′	
4	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	4
8	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	8
12	2	2	2	2	2	2	2	1	1	1	1	1	0	0	0	12
16	3	3	3	3	2	2	2	2	2	1	1	1	0	0	0	16
20	3	3	3	3	3	3	3	2	2	2	2	1	1	0	0	20

TABLE XIII.

AMPLITUDES.

DECLINATION.

Lat.	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°
°	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1	1 0	2 0	3 0	4 0	5 0	6 0	7 0	8 0	9 0	10 0	11 0	12 0	13 0	14 0
3	1 0	2 0	3 0	4 0	5 0	6 0	7 1	8 1	9 1	10 1	11 1	12 1	13 1	14 1
5	1 0	2 0	3 1	4 1	5 1	6 1	7 2	8 2	9 2	10 2	11 3	12 3	13 3	14 3
7	1 0	2 1	3 1	4 2	5 2	6 3	7 3	8 4	9 4	10 5	11 5	12 5	13 6	14 6
9	1 1	2 1	3 2	4 3	5 4	6 5	7 5	8 6	9 7	10 8	11 8	12 9	13 10	14 11
10	1 1	2 2	3 3	4 4	5 5	6 6	7 6	8 8	9 9	10 10	11 11	12 11	13 12	14 13
11	1 1	2 2	3 3	4 4	5 6	6 7	7 7	8 9	9 10	10 11	11 13	12 13	13 15	14 16
12	1 1	2 3	3 4	4 5	5 7	6 8	7 9	8 11	9 12	10 13	11 15	12 16	13 18	14 19
13	1 2	2 3	3 5	4 6	5 8	6 10	7 11	8 13	9 14	10 16	11 18	12 19	13 21	14 23
14	1 2	2 4	3 6	4 7	5 9	6 11	7 13	8 15	9 17	10 19	11 20	12 22	13 24	14 26
15	1 2	2 4	3 6	4 8	5 11	6 13	7 15	8 17	9 19	10 21	11 24	12 26	13 28	14 30
16	1 2	2 5	3 7	4 10	5 12	6 15	7 17	8 19	9 22	10 24	11 27	12 29	13 32	14 35
17	1 3	2 5	3 8	4 11	5 14	6 17	7 19	8 22	9 25	10 28	11 31	12 33	13 36	14 39
18	1 3	2 6	3 9	4 12	5 15	6 19	7 22	8 25	9 28	10 31	11 34	12 38	13 41	14 44
19	1 3	2 7	3 10	4 14	5 17	6 21	7 24	8 28	9 31	10 35	11 39	12 42	13 46	14 49
20	1 4	2 8	3 12	4 15	5 19	6 23	7 27	8 31	9 35	10 39	11 43	12 47	13 51	14 55
21	1 4	2 9	3 13	4 17	5 21	6 26	7 30	8 34	9 39	10 43	11 48	12 52	13 57	15 1
22	1 5	2 9	3 14	4 19	5 24	6 28	7 33	8 38	9 43	10 48	11 53	12 57	14 2	15 7
23	1 5	2 10	3 16	4 21	5 26	6 31	7 36	8 42	9 47	10 52	11 58	13 3	14 9	15 14
24	1 6	2 11	3 17	4 23	5 28	6 34	7 40	8 46	9 52	10 57	12 3	13 9	14 15	15 21
25	1 6	2 12	3 19	4 25	5 31	6 37	7 44	8 50	9 56	11 3	12 9	13 16	14 22	15 29
26	1 7	2 14	3 20	4 27	5 34	6 41	7 48	8 54	10 1	11 8	12 15	13 22	14 30	15 37
27	1 7	2 15	3 22	4 29	5 37	6 44	7 52	8 59	10 7	11 14	12 22	13 30	14 37	15 45
28	1 8	2 16	3 24	4 32	5 40	6 48	7 56	9 4	10 12	11 21	12 29	13 37	14 46	15 54
29	1 9	2 17	3 26	4 34	5 43	6 52	8 1	9 9	10 18	11 27	12 36	13 45	14 54	16 3
30	1 9	2 19	3 28	4 37	5 47	6 56	8 5	9 15	10 24	11 34	12 44	13 53	15 3	16 13
31	1 10	2 20	3 30	4 40	5 50	7 0	8 10	9 21	10 31	11 41	12 52	14 2	15 13	16 24
32	1 11	2 22	3 32	4 43	5 54	7 5	8 16	9 27	10 38	11 49	13 0	14 11	15 23	16 34
33	1 12	2 23	3 35	4 46	5 58	7 10	8 21	9 33	10 45	11 57	13 9	14 21	15 34	16 46
34	1 12	2 25	3 37	4 50	6 2	7 15	8 27	9 40	10 53	12 5	13 18	14 31	15 45	16 58
35	1 13	2 27	3 40	4 53	6 6	7 20	8 33	9 47	11 1	12 14	13 28	14 42	15 56	17 11
36	1 14	2 28	3 43	4 57	6 11	7 25	8 40	9 54	11 9	12 24	13 39	14 54	16 9	17 24
37	1 15	2 30	3 45	5 1	6 16	7 31	8 47	10 2	11 18	12 33	13 49	15 5	16 22	17 38
38	1 16	2 32	3 48	5 5	6 21	7 37	8 54	10 10	11 27	12 44	14 1	15 18	16 35	17 53
39	1 17	2 34	3 52	5 9	6 26	7 44	9 1	10 19	11 37	12 55	14 13	15 31	16 50	18 8
40	1 18	2 37	3 55	5 13	6 32	7 51	9 9	10 28	11 47	13 6	14 25	15 45	17 5	18 25
41	1 20	2 39	3 59	5 18	6 38	7 58	9 18	10 38	11 58	13 18	14 39	15 59	17 20	18 42
42	1 21	2 42	4 2	5 23	6 44	8 5	9 26	10 48	12 9	13 31	14 53	16 15	17 37	19 0
43	1 22	2 44	4 6	5 28	6 51	8 13	9 36	10 58	12 21	13 44	15 7	16 31	17 55	19 19
44	1 23	2 47	4 10	5 34	6 58	8 21	9 45	11 9	12 34	13 58	15 23	16 48	18 13	19 39
45	1 25	2 50	4 15	5 40	7 5	8 30	9 55	11 21	12 47	14 13	15 39	17 6	18 33	20 0
46	1 26	2 53	4 19	5 46	7 12	8 39	10 6	11 33	13 1	14 29	15 57	17 25	18 54	20 23
47	1 28	2 56	4 24	5 52	7 21	8 49	10 18	11 46	13 16	14 45	16 15	17 45	19 16	20 47
48	1 30	2 59	4 29	5 59	7 29	8 59	10 30	12 0	13 31	15 2	16 34	18 6	19 39	21 12
49	1 31	3 3	4 35	6 6	7 38	9 10	10 42	12 15	13 48	15 21	16 54	18 29	20 3	21 38
50	1 33	3 7	4 40	6 14	7 48	9 22	10 56	12 30	14 5	15 40	17 16	18 52	20 29	22 7
51	1 35	3 11	4 46	6 22	7 58	9 34	11 10	12 47	14 24	16 1	17 39	19 17	20 57	22 36
52	1 37	3 15	4 53	6 30	8 8	9 47	11 25	13 4	14 43	16 23	18 3	19 44	21 26	23 8
53	1 40	3 19	4 59	8 20	10 0	11 41	13 22	15 4	16 46	18 29	20 13	21 57	23 42	
54	1 42	3 24	5 7	6 49	8 32	10 15	11 58	13 42	15 26	17 11	18 57	20 43	22 30	24 18
55	1 45	3 29	5 14	6 59	8 44	10 30	12 16	14 3	15 50	17 37	19 26	21 15	23 5	24 57
56	1 47	3 35	5 22	7 10	8 58	10 46	12 35	14 25	16 15	18 5	19 57	21 50	23 43	25 38
57	1 50	3 40	5 31	7 22	9 13	11 4	12 56	14 48	16 42	18 36	20 30	22 26	24 24	26 22
58	1 53	3 47	5 40	7 34	9 28	11 23	13 18	15 14	17 10	19 8	21 6	23 6	25 7	27 10
59	1 57	3 53	5 50	7 47	9 45	11 43	13 41	15 41	17 41	19 42	21 45	23 49	25 54	28 1
60	2 0	4 0	6 0	8 1	10 2	12 4	14 6	16 10	18 14	20 19	22 26	24 34	26 44	28 56
61	2 4	4 8	6 12	8 16	10 21	12 27	14 34	16 41	18 49	20 59	23 11	25 24	27 39	29 56
62	2 8	4 16	6 24	8 33	10 42	12 52	15 3	17 15	19 28	21 42	23 59	26 17	28 38	31 1
63	2 12	4 25	6 37	8 50	11 4	13 19	15 34	17 51	20 9	22 29	24 51	27 15	29 42	32 12
64	2 17	4 34	6 51	9 9	11 28	13 48	16 8	18 31	20 54	23 20	25 48	28 19	30 52	33 30
65	2 22	4 44	7 7	9 30	11 54	14 19	16 46	19 14	21 44	24 16	26 50	29 28	32 10	34 55
66	2 28	4 55	7 24	9 53	12 22	14 54	17 26	20 1	22 37	25 16	27 59	30 45	33 35	36 30

TABLE XIII.

AMPLITUDES.

Lat.	DECLINATION 15°	16°	17°	18°	19°	20°	21°	21° 30′	22°	22° 30′	23°	23° 28′
°	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1	15 0	16 0	17 0	18 0	19 0	20 0	21 0	21 30	22 0	22 30	23 0	23 28
3	15 1	16 1	17 1	18 2	19 2	20 2	21 2	21 32	22 2	22 32	23 2	23 30
5	15 4	16 4	17 4	18 4	19 5	20 5	21 5	21 35	22 5	22 35	23 6	23 34
7	15 7	16 7	17 8	18 8	19 9	20 9	21 10	21 40	22 10	22 41	23 11	23 39
9	15 11	16 12	17 13	18 14	19 15	20 16	21 16	21 47	22 17	22 48	23 18	23 47
10	15 14	16 15	17 16	18 17	19 18	20 19	21 20	21 51	22 21	22 52	23 23	23 51
11	15 17	16 18	17 20	18 21	19 22	20 24	21 25	21 55	22 26	22 57	23 28	23 56
12	15 21	16 22	17 23	18 25	19 26	20 28	21 30	22 0	22 31	23 2	23 33	24 1
13	15 24	16 26	17 28	18 29	19 31	20 33	21 35	22 6	22 37	23 8	23 38	24 7
14	15 28	16 30	17 32	18 34	19 36	20 38	21 40	22 11	22 43	23 14	23 45	24 14
15	15 33	16 35	17 37	18 39	19 42	20 44	21 47	22 18	22 49	23 20	23 52	24 21
16	15 37	16 40	17 42	18 45	19 48	20 51	21 53	22 25	22 56	23 28	23 59	24 28
17	15 42	16 45	17 48	18 51	19 54	20 57	22 1	22 32	23 4	23 35	24 7	24 36
18	15 47	16 51	17 54	18 58	20 1	21 5	22 8	22 40	23 12	23 44	24 15	24 45
19	15 53	16 57	18 1	19 5	20 8	21 12	22 16	22 49	23 20	23 52	24 25	24 54
20	15 59	17 3	18 8	19 12	20 16	21 21	22 25	22 57	23 30	24 2	24 34	25 4
21	16 6	17 10	18 15	19 20	20 25	21 29	22 34	23 7	23 39	24 12	24 45	25 15
22	16 13	17 18	18 23	19 28	20 33	21 39	22 44	23 17	23 50	24 23	24 55	25 26
23	16 20	17 25	18 31	19 37	20 43	21 49	22 55	23 28	24 1	24 34	25 7	25 38
24	16 27	17 34	18 40	19 46	20 53	21 59	23 6	23 39	24 13	24 46	25 19	25 51
25	16 36	17 42	18 49	19 56	21 3	22 10	23 18	23 51	24 25	24 59	25 32	26 4
26	16 44	17 52	18 59	20 7	21 14	22 22	23 30	24 4	24 38	25 12	25 46	26 18
27	16 53	18 1	19 9	20 18	21 26	22 34	23 43	24 17	24 52	25 26	26 1	26 33
28	17 3	18 11	19 20	20 29	21 38	22 47	23 57	24 31	25 6	25 41	26 16	26 49
29	17 13	18 22	19 32	20 41	21 51	23 1	24 11	24 46	25 22	25 57	26 32	27 5
30	17 23	18 34	19 44	20 54	22 5	23 16	24 27	25 2	25 38	26 13	26 49	27 23
31	17 34	18 45	19 57	21 8	22 19	23 31	24 43	25 19	25 55	26 31	27 7	27 41
32	17 46	18 58	20 10	21 22	22 35	23 47	25 0	25 36	26 13	26 49	27 26	28 0
33	17 59	19 11	20 24	21 37	22 51	24 4	25 18	25 55	26 32	27 9	27 46	28 21
34	18 11	19 25	20 39	21 53	23 7	24 22	25 37	26 14	26 52	27 29	28 7	28 42
35	18 25	19 40	20 55	22 10	23 25	24 41	25 57	26 35	27 13	27 51	28 29	29 5
36	18 39	19 55	21 11	22 27	23 44	25 1	26 18	26 56	27 35	28 14	28 53	29 30
37	18 55	20 11	21 28	22 46	24 3	25 21	26 40	27 19	27 58	28 38	29 17	29 55
38	19 10	20 28	21 47	23 5	24 24	25 43	27 3	27 43	28 23	29 3	29 44	30 21
39	19 27	20 46	22 6	23 26	24 46	26 7	27 28	28 8	28 49	29 30	30 11	30 49
40	19 45	21 5	22 26	23 47	25 9	26 31	27 54	28 35	29 17	29 58	30 40	31 19
41	20 3	21 25	22 48	24 10	25 33	26 57	28 21	29 3	29 46	30 28	31 11	31 51
42	20 23	21 46	23 10	24 34	25 59	27 24	28 50	29 33	30 16	31 0	31 43	32 24
43	20 44	22 8	23 34	25 0	26 26	27 53	29 20	30 5	30 49	31 33	32 18	32 59
44	21 5	22 32	23 59	25 26	26 55	28 23	29 53	30 38	31 23	32 8	32 54	33 37
45	21 28	22 57	24 25	25 55	27 25	28 56	30 27	31 13	31 59	32 46	33 33	34 17
46	21 53	23 23	24 53	26 25	27 57	29 30	31 3	31 51	32 38	33 26	34 14	34 59
47	22 18	23 50	25 23	26 57	28 31	30 6	31 42	32 30	33 19	34 8	34 57	35 44
48	22 45	24 20	25 55	27 30	29 7	30 44	32 23	33 13	34 3	34 53	35 44	36 31
49	23 14	24 51	26 28	28 6	29 45	31 25	33 7	33 58	34 49	35 41	36 33	37 22
50	23 45	25 24	27 3	28 44	30 26	32 9	33 53	34 46	35 39	36 32	37 26	38 17
51	24 17	25 59	27 41	29 25	31 9	32 55	34 43	35 37	36 32	37 27	38 23	39 15
52	24 52	26 36	28 21	30 8	31 56	33 45	35 36	36 32	37 29	38 26	39 24	40 18
53	25 28	27 16	29 4	30 54	32 45	34 38	36 33	37 31	38 30	39 29	40 29	41 26
54	26 7	27 58	29 50	31 43	33 38	35 35	37 34	38 34	39 36	40 37	41 40	42 39
55	26 49	28 43	30 39	32 36	34 35	36 36	38 40	39 43	40 47	41 51	42 56	43 58
56	27 34	29 32	31 31	33 33	35 36	37 42	39 51	40 57	42 4	43 11	44 20	45 24
57	28 22	30 24	32 28	34 34	36 43	38 54	41 9	42 18	43 27	44 38	45 50	46 59
58	29 14	31 21	33 29	35 40	37 54	40 12	42 33	43 45	44 59	46 14	47 30	48 43
59	30 10	32 21	34 35	36 52	39 12	41 37	44 6	45 22	46 40	47 59	49 21	50 38
60	31 10	33 27	35 47	38 10	40 38	43 10	45 47	47 8	48 31	49 56	51 24	52 47
61	32 16	34 39	37 5	39 36	42 11	44 52	47 40	49 7	50 36	52 7	53 42	55 13
62	33 27	35 57	38 31	41 10	43 54	46 46	49 46	51 19	52 56	54 36	56 20	58 1
63	34 45	37 23	40 5	42 54	45 49	48 53	52 8	53 50	55 36	57 27	59 23	61 18
64	36 11	38 58	41 50	44 49	47 58	51 17	54 50	56 44	58 43	60 48	63 2	65 17
65	37 46	40 43	43 46	46 59	50 23	54 2	57 59	60 8	62 25	64 53	67 36	70 26
66	39 31	42 40	45 57	49 27	53 10	57 14	61 46	64 18	67 4	70 12	73 52	78 15

TABLE XIV.

SEMIDIURNAL AND SEMINOCTURNAL ARCHES,

For finding the Time of the Rising and Setting of a Celestial Object.

DECLINATION.

Lat	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	Lat
°	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	°
1	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 01	6 01	6 01	6 01	6 01	6 01	6 01	6 01	6 01	1
3	6 00	6 00	6 00	6 01	6 01	6 01	6 01	6 02	6 02	6 02	6 02	6 02	6 03	6 03	6 03	6 03	3
5	6 00	6 01	6 01	6 01	6 02	6 02	6 02	6 03	6 03	6 04	6 04	6 04	6 05	6 05	6 05	6 06	5
7	6 00	6 01	6 01	6 02	6 02	6 03	6 03	6 04	6 04	6 05	6 05	6 06	6 06	6 07	6 08	6 08	7
9	6 01	6 01	6 02	6 02	6 03	6 04	6 04	6 05	6 06	6 06	6 07	6 08	6 09	6 10	6 10	6 10	9
10	6 01	6 01	6 02	6 03	6 04	6 04	6 05	6 06	6 06	6 07	6 08	6 09	6 10	6 11	6 12	6 12	10
11	6 01	6 02	6 02	6 03	6 04	6 05	6 05	6 06	6 07	6 08	6 09	6 09	6 10	6 11	6 12	6 13	11
12	6 01	6 02	6 03	6 03	6 04	6 05	6 06	6 07	6 08	6 09	6 09	6 10	6 11	6 12	6 13	6 14	12
13	6 01	6 02	6 03	6 04	6 05	6 06	6 06	6 07	6 08	6 09	6 10	6 11	6 12	6 13	6 14	6 15	13
14	6 01	6 02	6 03	6 04	6 05	6 06	6 07	6 08	6 09	6 10	6 11	6 12	6 13	6 14	6 15	6 16	14
15	6 01	6 02	6 03	6 04	6 05	6 06	6 08	6 09	6 10	6 11	6 12	6 13	6 14	6 15	6 16	6 18	15
16	6 01	6 02	6 03	6 05	6 06	6 07	6 08	6 09	6 10	6 12	6 13	6 14	6 15	6 16	6 18	6 19	16
17	6 01	6 02	6 04	6 05	6 06	6 07	6 09	6 10	6 11	6 12	6 14	6 15	6 16	6 17	6 19	6 20	17
18	6 01	6 03	6 04	6 05	6 07	6 08	6 09	6 10	6 12	6 13	6 14	6 16	6 17	6 19	6 20	6 21	18
19	6 01	6 03	6 04	6 06	6 07	6 08	6 10	6 11	6 13	6 14	6 15	6 17	6 18	6 20	6 21	6 23	19
20	6 01	6 03	6 04	6 06	6 07	6 09	6 10	6 12	6 13	6 15	6 16	6 18	6 19	6 21	6 22	6 24	20
21	6 02	6 03	6 05	6 06	6 08	6 09	6 11	6 12	6 14	6 16	6 17	6 19	6 20	6 22	6 24	6 25	21
22	6 02	6 03	6 05	6 06	6 08	6 10	6 11	6 13	6 15	6 16	6 18	6 20	6 21	6 23	6 25	6 27	22
23	6 02	6 03	6 05	6 07	6 09	6 10	6 12	6 14	6 15	6 17	6 19	6 21	6 22	6 24	6 26	6 28	23
24	6 02	6 04	6 05	6 07	6 09	6 11	6 13	6 14	6 16	6 18	6 20	6 22	6 24	6 26	6 27	6 29	24
25	6 02	6 04	6 06	6 07	6 09	6 11	6 13	6 15	6 17	6 19	6 21	6 23	6 25	6 27	6 29	6 31	25
26	6 02	6 04	6 06	6 08	6 10	6 12	6 14	6 16	6 18	6 20	6 22	6 24	6 26	6 28	6 30	6 32	26
27	6 02	6 04	6 06	6 08	6 10	6 12	6 14	6 16	6 19	6 21	6 23	6 25	6 27	6 29	6 31	6 34	27
28	6 02	6 04	6 06	6 09	6 11	6 13	6 15	6 17	6 19	6 22	6 24	6 26	6 28	6 30	6 33	6 35	28
29	6 02	6 04	6 07	6 09	6 11	6 13	6 16	6 18	6 20	6 22	6 25	6 27	6 29	6 32	6 34	6 37	29
30	6 02	6 05	6 07	6 09	6 12	6 14	6 16	6 19	6 21	6 23	6 26	6 28	6 31	6 33	6 36	6 38	30
31	6 02	6 05	6 07	6 10	6 12	6 14	6 17	6 19	6 22	6 24	6 27	6 29	6 32	6 34	6 37	6 40	31
32	6 02	6 05	6 08	6 10	6 13	6 15	6 18	6 20	6 23	6 25	6 28	6 31	6 33	6 36	6 39	6 41	32
33	6 03	6 05	6 08	6 10	6 13	6 16	6 18	6 21	6 24	6 26	6 29	6 32	6 34	6 37	6 40	6 43	33
34	6 03	6 05	6 08	6 11	6 14	6 16	6 19	6 22	6 25	6 27	6 30	6 33	6 36	6 39	6 42	6 45	34
35	6 03	6 06	6 08	6 11	6 14	6 17	6 20	6 23	6 25	6 28	6 31	6 34	6 37	6 40	6 43	6 46	35
36	6 03	6 06	6 09	6 12	6 15	6 18	6 20	6 23	6 26	6 29	6 32	6 36	6 39	6 42	6 45	6 48	36
37	6 03	6 06	6 09	6 12	6 15	6 18	6 21	6 24	6 27	6 31	6 34	6 37	6 40	6 43	6 47	6 50	37
38	6 03	6 06	6 09	6 13	6 16	6 19	6 22	6 25	6 28	6 32	6 35	6 38	6 42	6 45	6 48	6 52	38
39	6 03	6 06	6 10	6 13	6 16	6 20	6 23	6 26	6 29	6 33	6 36	6 40	6 43	6 47	6 50	6 54	39
40	6 03	6 07	6 10	6 13	6 17	6 20	6 24	6 27	6 31	6 34	6 38	6 41	6 45	6 48	6 52	6 56	40
41	6 03	6 07	6 10	6 14	6 17	6 21	6 25	6 28	6 32	6 35	6 39	6 43	6 46	6 50	6 54	6 58	41
42	6 04	6 07	6 11	6 14	6 18	6 22	6 25	6 29	6 33	6 37	6 40	6 44	6 48	6 52	6 56	7 00	42
43	6 04	6 07	6 11	6 15	6 19	6 22	6 26	6 30	6 34	6 38	6 42	6 46	6 50	6 54	6 58	7 02	43
44	6 04	6 08	6 12	6 15	6 19	6 23	6 27	6 31	6 35	6 39	6 43	6 47	6 52	6 56	7 00	7 04	44
45	6 04	6 08	6 12	6 16	6 20	6 24	6 28	6 32	6 36	6 41	6 45	6 49	6 53	6 58	7 02	7 07	45
46	6 04	6 08	6 12	6 17	6 21	6 25	6 29	6 33	6 38	6 42	6 46	6 51	6 55	7 00	7 04	7 09	46
47	6 04	6 09	6 13	6 17	6 22	6 26	6 30	6 35	6 39	6 44	6 48	6 53	6 57	7 02	7 07	7 12	47
48	6 04	6 09	6 13	6 18	6 22	6 27	6 31	6 36	6 41	6 45	6 50	6 55	6 59	7 04	7 09	7 14	48
49	6 05	6 09	6 14	6 18	6 23	6 28	6 32	6 37	6 42	6 47	6 52	6 57	7 02	7 07	7 12	7 17	49
50	6 05	6 10	6 14	6 19	6 24	6 29	6 34	6 39	6 44	6 49	6 54	6 59	7 04	7 09	7 14	7 20	50
51	6 05	6 10	6 15	6 20	6 25	6 30	6 35	6 40	6 45	6 50	6 56	7 01	7 06	7 12	7 17	7 23	51
52	6 05	6 10	6 15	6 21	6 26	6 31	6 36	6 41	6 47	6 52	6 58	7 03	7 09	7 14	7 20	7 26	52
53	6 05	6 11	6 16	6 21	6 27	6 32	6 38	6 43	6 49	6 54	7 00	7 06	7 11	7 17	7 23	7 29	53
54	6 06	6 11	6 17	6 22	6 28	6 33	6 39	6 45	6 50	6 56	7 02	7 08	7 14	7 20	7 27	7 33	54
55	6 06	6 11	6 17	6 23	6 29	6 35	6 40	6 46	6 52	6 58	7 04	7 11	7 17	7 23	7 30	7 37	55
56	6 06	6 12	6 18	6 24	6 30	6 36	6 42	6 48	6 54	7 01	7 07	7 13	7 20	7 27	7 34	7 41	56
57	6 06	6 12	6 19	6 25	6 31	6 37	6 44	6 50	6 56	7 03	7 10	7 16	7 23	7 30	7 37	7 45	57
58	6 06	6 13	6 19	6 26	6 32	6 39	6 45	6 52	6 59	7 06	7 12	7 20	7 27	7 34	7 42	7 49	58
59	6 07	6 13	6 20	6 27	6 33	6 40	6 47	6 54	7 01	7 08	7 16	7 23	7 30	7 38	7 46	7 54	59
60	6 07	6 14	6 21	6 28	6 35	6 42	6 49	6 56	7 04	7 11	7 19	7 26	7 34	7 42	7 51	7 59	60
61	6 07	6 14	6 22	6 29	6 36	6 44	6 51	6 59	7 06	7 14	7 22	7 30	7 38	7 47	7 56	8 05	61
62	6 08	6 15	6 23	6 30	6 38	6 46	6 53	7 01	7 09	7 17	7 26	7 34	7 43	7 52	8 01	8 11	62
63	6 08	6 16	6 24	6 32	6 40	6 48	6 56	7 04	7 12	7 21	7 30	7 39	7 48	7 57	8 07	8 17	63
64	6 08	6 16	6 25	6 33	6 41	6 50	6 58	7 07	7 16	7 25	7 34	7 43	7 53	8 03	8 13	8 24	64
65	6 09	6 17	6 26	6 34	6 43	6 52	7 01	7 10	7 19	7 29	7 39	7 48	7 59	8 09	8 20	8 32	65

TABLE XIV.

SEMIDIURNAL AND SEMINOCTURNAL ARCHES,

For finding the Time of the Rising and Setting of a Celestial Object.

DECLINATION.

Lat	17°	18°	19°	20°	21°	22°	23°	24°	25°	26°	27°	28°	29°	30°	Lat
°	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	°
1	6 01	6 01	6 01	6 01	6 02	6 02	6 02	6 02	6 02	6 02	6 02	6 02	6 02	6 02	1
3	6 04	6 04	6 04	6 04	6 05	6 05	6 05	6 05	6 06	6 06	6 06	6 06	6 07	6 07	3
5	6 06	6 07	6 07	6 08	6 08	6 09	6 09	6 09	6 10	6 10	6 11	6 11	6 12	6 12	5
7	6 09	6 09	6 10	6 10	6 11	6 11	6 12	6 13	6 13	6 14	6 14	6 15	6 16	6 16	7
9	6 11	6 12	6 13	6 13	6 14	6 15	6 15	6 16	6 17	6 18	6 19	6 19	6 20	6 21	9
10	6 12	6 13	6 14	6 15	6 16	6 16	6 17	6 18	6 19	6 20	6 21	6 22	6 22	6 23	10
11	6 14	6 14	6 15	6 16	6 17	6 18	6 19	6 20	6 21	6 22	6 23	6 24	6 25	6 26	11
12	6 15	6 16	6 17	6 18	6 19	6 20	6 21	6 22	6 23	6 24	6 25	6 26	6 27	6 28	12
13	6 16	6 17	6 18	6 19	6 20	6 21	6 22	6 24	6 25	6 26	6 27	6 28	6 29	6 31	13
14	6 17	6 19	6 20	6 21	6 22	6 23	6 24	6 25	6 27	6 28	6 29	6 30	6 32	6 33	14
15	6 19	6 20	6 21	6 22	6 24	6 25	6 26	6 27	6 29	6 30	6 31	6 33	6 34	6 36	15
16	6 20	6 21	6 23	6 24	6 25	6 27	6 28	6 29	6 31	6 32	6 34	6 35	6 37	6 38	16
17	6 21	6 23	6 24	6 26	6 27	6 28	6 30	6 31	6 33	6 34	6 36	6 37	6 39	6 41	17
18	6 23	6 24	6 26	6 27	6 29	6 30	6 32	6 33	6 35	6 36	6 38	6 40	6 41	6 43	18
19	6 24	6 26	6 27	6 29	6 30	6 32	6 34	6 35	6 37	6 39	6 40	6 42	6 44	6 46	19
20	6 26	6 27	6 29	6 30	6 32	6 34	6 36	6 37	6 39	6 41	6 43	6 45	6 47	6 49	20
21	6 27	6 29	6 30	6 32	6 34	6 36	6 38	6 39	6 41	6 43	6 45	6 47	6 49	6 51	21
22	6 28	6 30	6 32	6 34	6 36	6 38	6 39	6 41	6 43	6 45	6 48	6 50	6 52	6 54	22
23	6 30	6 32	6 34	6 36	6 38	6 39	6 42	6 44	6 46	6 48	6 50	6 52	6 54	6 57	23
24	6 31	6 33	6 35	6 37	6 39	6 41	6 44	6 46	6 48	6 50	6 52	6 55	6 57	7 00	24
25	6 33	6 35	6 37	6 39	6 41	6 43	6 46	6 48	6 50	6 53	6 55	6 57	7 00	7 02	25
26	6 34	6 36	6 39	6 41	6 43	6 45	6 48	6 50	6 53	6 55	6 58	7 00	7 03	7 05	26
27	6 36	6 38	6 40	6 43	6 45	6 48	6 50	6 52	6 55	6 58	7 00	7 03	7 06	7 08	27
28	6 37	6 40	6 42	6 45	6 47	6 50	6 52	6 55	6 57	7 00	7 03	7 06	7 09	7 11	28
29	6 39	6 42	6 44	6 47	6 49	6 52	6 54	6 57	7 00	7 03	7 06	7 09	7 12	7 15	29
30	6 41	6 43	6 46	6 49	6 51	6 54	6 57	7 00	7 02	7 05	7 08	7 11	7 15	7 18	30
31	6 42	6 45	6 48	6 51	6 53	6 56	6 59	7 02	7 05	7 08	7 11	7 14	7 18	7 21	31
32	6 44	6 47	6 50	6 53	6 56	6 58	7 01	7 05	7 08	7 11	7 14	7 18	7 21	7 25	32
33	6 46	6 49	6 52	6 55	6 58	7 01	7 04	7 07	7 11	7 14	7 17	7 21	7 24	7 28	33
34	6 48	6 51	6 54	6 57	7 00	7 03	7 07	7 10	7 13	7 17	7 20	7 24	7 28	7 32	34
35	6 49	6 53	6 56	6 59	7 02	7 06	7 09	7 13	7 16	7 20	7 24	7 27	7 31	7 35	35
36	6 51	6 55	6 58	7 01	7 05	7 08	7 12	7 16	7 19	7 23	7 27	7 31	7 35	7 39	36
37	6 53	6 57	7 00	7 04	7 07	7 11	7 15	7 18	7 22	7 26	7 30	7 34	7 39	7 43	37
38	6 55	6 59	7 02	7 06	7 10	7 14	7 17	7 21	7 25	7 30	7 34	7 38	7 43	7 47	38
39	6 57	7 01	7 05	7 09	7 12	7 16	7 20	7 25	7 29	7 33	7 37	7 42	7 47	7 51	39
40	6 59	7 03	7 07	7 11	7 15	7 19	7 23	7 28	7 32	7 37	7 41	7 46	7 51	7 56	40
41	7 02	7 06	7 10	7 14	7 18	7 22	7 27	7 31	7 36	7 40	7 45	7 50	7 55	8 00	41
42	7 04	7 08	7 12	7 17	7 21	7 25	7 30	7 35	7 39	7 44	7 49	7 55	8 00	8 05	42
43	7 06	7 11	7 15	7 19	7 24	7 29	7 33	7 38	7 43	7 48	7 53	7 59	8 04	8 10	43
44	7 09	7 13	7 18	7 22	7 27	7 32	7 37	7 42	7 47	7 52	7 58	8 04	8 09	8 16	44
45	7 11	7 16	7 21	7 25	7 30	7 35	7 40	7 46	7 51	7 57	8 03	8 08	8 15	8 21	45
46	7 14	7 19	7 24	7 29	7 34	7 39	7 44	7 50	7 55	8 01	8 07	8 14	8 20	8 27	46
47	7 17	7 22	7 27	7 32	7 37	7 43	7 48	7 54	8 00	8 06	8 12	8 19	8 26	8 33	47
48	7 19	7 25	7 30	7 35	7 41	7 47	7 53	7 59	8 05	8 11	8 18	8 25	8 32	8 40	48
49	7 22	7 28	7 33	7 39	7 45	7 51	7 57	8 03	8 10	8 17	8 24	8 31	8 38	8 46	49
50	7 25	7 31	7 37	7 43	7 49	7 55	8 02	8 08	8 15	8 22	8 30	8 37	8 45	8 54	50
51	7 29	7 35	7 41	7 47	7 53	8 00	8 06	8 13	8 21	8 28	8 36	8 44	8 53	9 02	51
52	7 32	7 38	7 45	7 51	7 58	8 05	8 12	8 19	8 27	8 35	8 43	8 52	9 01	9 11	52
53	7 36	7 42	7 49	7 56	8 02	8 10	8 17	8 25	8 33	8 41	8 50	9 00	9 09	9 20	53
54	7 40	7 46	7 53	8 00	8 08	8 15	8 23	8 31	8 40	8 49	8 58	9 08	9 19	9 30	54
55	7 44	7 51	7 58	8 05	8 13	8 21	8 29	8 38	8 47	8 57	9 07	9 18	9 29	9 42	55
56	7 48	7 55	8 03	8 11	8 19	8 27	8 36	8 45	8 55	9 05	9 16	9 28	9 41	9 55	56
57	7 52	8 00	8 08	8 16	8 25	8 34	8 43	8 53	9 04	9 15	9 27	9 40	9 54	10 11	57
58	7 57	8 05	8 14	8 22	8 32	8 41	8 51	9 02	9 13	9 25	9 38	9 53	10 10	10 30	58
59	8 02	8 11	8 20	8 29	8 39	8 49	9 00	9 11	9 24	9 37	9 52	10 09	10 29	10 56	59
60	8 08	8 17	8 26	8 36	8 47	8 58	9 09	9 22	9 35	9 51	10 08	10 28	10 55	12 00	60
61	8 14	8 24	8 34	8 44	8 55	9 07	9 20	9 34	9 49	10 07	10 27	10 54	12 00		61
62	8 20	8 31	8 42	8 53	9 05	9 18	9 32	9 47	10 05	10 26	10 54	12 00			62
63	8 27	8 38	8 50	9 02	9 16	9 30	9 46	10 04	10 25	10 53	12 00				63
64	8 35	8 47	9 00	9 13	9 28	9 44	10 02	10 24	10 52	12 00					64
65	8 44	8 57	9 10	9 25	9 42	10 00	10 22	10 51	12 00						65

TABLE XV.

The RIGHT ASCENSIONS and DECLINATIONS of the PRINCIPAL FIXED STARS, adapted to JANUARY 1, 1870.

Charac.	Constellations. Pr. Names.	Magnitudes.	Right Ascension in Time.	Ann. Var. of R. A.	Declination.	Ann. Var. of Declin.
			h. m. s.	s.	° ′ ″	″
α	Andromeda .....*Alpheratz* ...	1	0 1 40	+ 3.09	28 22 22 N	+19.90
γ	Pegasus .....*Algenib*	2.3	0 6 33	+ 3.08	14 27 38 N	+20.03
α	Cassiopeia .....*Schedar*	Var.	0 33 9	+ 3.36	55 49 26 N	+19.81
α	Ursa Minor .....*Pole Star* ...	2.3	1 11 17	+20.20	88 36 59 N	+19.09
α	Eridanus .....*Achernar* ...	1	1 32 52	+ 2.23	57 53 52 S.	−18.42
α	Aries .....ARIETIS	3	1 59 51	+ 3.37	22 50 47 N	+17.22
α	Cetus.....*Menkar*	2.3	2 55 29	+ 3.13	3 34 40 N	+14.34
α	Perseus.....	2.3	3 15 3	+ 4.25	49 23 45 N	+13.17
α	Taurus .....ALDEBARAN.	1	4 28 28	+ 3.44	16 14 44 N	+ 7.62
α	Auriga .....*Capella*	1	5 7 5	+ 4.42	45 51 45 N	+ 4.15
β	Orion.....*Rigel*	1	5 8 17	+ 2.88	8 21 15 S.	− 4.46
β	Taurus	2	5 18 4	+ 3.79	28 29 40 N	+ 3.45
γ	Orion.....*Bellatrix* ...	2	5 17 38	+ 3.21	6 13 11 N	+ 3.82
δ	Orion.....	2	5 25 22	+ 3.06	0 23 53 S.	+ 2.98
ε	Orion.....	2.3	5 29 37	+ 3.04	1 17 15 S.	+ 2.64
α	Columba	2	5 34 57	+ 2.18	34 8 40 S.	− 2.19
α	Orion.....*Betelguese* ...	1	5 48 8	+ 3.25	7 22 49 N	+ 1.04
α	Argo .....*Canopus*	1	6 21 4	+ 1.33	52 37 32 S.	− 1.84
α	Canis Major.....*Sirius*	1	6 39 25	+ 2.65	16 32 24 S.	− 4.66
α	Gemini .....*Castor*.....	3	7 26 18	+ 3.84	32 10 15 N	− 7.45
α	Canis Minor.....*Procyon*	1.2	7 32 30	+ 3.14	5 33 22 N	− 8.91
β	Gemini .....POLLUX	2	7 37 21	+ 3.68	28 20 16 N	− 8.32
ξ	Argo Navis	2	9 13 36	+ 1.60	58 43 47 S.	−14.93
η	Argo Navis	1	10 40 1	+ 2.31	59 0 3 S.	−18.76
α	Hydra .....*Alphard*.....	2	9 21 12	+ 2.95	8 5 48 S.	−15.40
α	Leo .....REGULUS ...	1	10 1 27	+ 3.20	12 36 5 N	−17.42
α	Ursa Major .....*Dubhe*.....	1.2	10 55 41	+ 3.77	62 27 7 N	−19.36
β	Leo .....*Deneb*	2.3	11 42 26	+ 3.06	15 17 55 N	−20.10
γ	Ursa Major	2	11 46 59	+ 3.19	54 25 3 N	−20 03
α	Crux	1	12 19 23	+ 3.27	62 22 38 S.	−19 93
γ	Crux	2	12 23 37	+ 3.26	56 19 24 S.	+19.95
α	Virgo.....SPICA	1	13 18 21	+ 3.15	10 28 55 S.	−18.93
η	Ursa Major .....*Benetnach* ...	2.3	13 42 25	+ 2.37	49 57 46 N	−18.11
β	Centaur	1	13 54 40	+ 4.46	59 44 40 S.	−17.66
α	Bootes .....*Arcturus* ...	1	14 9 44	+ 2.73	19 51 37 N	−18.90
ε	Bootes	2.3	14 30 19	+ 2.62	27 37 24 N	−15.40
α^2	Centaur.....	1	14 30 48	+ 4.04	60 17 39 S.	−15 02
α^2	Libra.....*Zubenesch* ...	3	14 43 41	+ 3.31	15 29 59 S.	−15.21
β	Libra.....*Zubenelg*	2.3	15 10 1	+ 3.22	8 54 5 S.	−13.56
α	Corona Borealis *Alphacca* ...	2	15 29 11	+ 2.54	27 9 14 N	−12.33
α	Serpens.....	2.3	15 37 52	+ 2.95	6 50 11 N	−11.60
α	Scorpio .....ANTARES ...	1	16 21 26	+ 3.67	26 8 28 S.	− 8.39
α	Hercules .....*Ras Algethi*.	3.4	17 8 43	+ 2.73	14 32 26 N	− 4.40
α	Ophiuchus .....*Ras Alhague*.	2	17 28 54	+ 2.78	12 39 24 N	− 2.92
γ	Draco .....*Rastaban* ...	2	17 53 35	+ 1.39	51 30 18 N	− 0.60
α	Lyra .....*Vega*	1	18 32 32	+ 2.03	38 39 51 N	+ 3.13
α	AQUILÆ .....ALTAIR	1.2	19 44 26	+ 2.93	8 31 37 N	+ 9.21
α	Pavo	2	20 15 21	+ 4.80	57 8 54 S.	−11.14
α	Cygnus.....*Deneb*.....	1	20 37 0	+ 2.04	44 49 1 N	+12.69
α	Cepheus .....*Alderaimin*..	3	21 15 29	+ 1.44	62 2 6 N	+15.11
α	Aquarius	3	21 59 6	+ 3.08	0 57 2 S.	−17.32
α	Grux.....	2	22 0 2	+ 3.81	47 35 20 S.	−17.19
α	Pisc. Australis...FOMALHAUT	1	22 50 28	+ 3.33	30 18 38 S.	−18.97
β	Pegasus .....*Scheat*.....	2	22 56 58	+ 2.88	27 19 26 N	+19.26
*α	PEGASUS .....MARCAB.....	2	22 58 17	+ 2.98	14 30 23 N	+19.31

TABLE XVI.

For finding the APPARENT TIME of the PRINCIPAL STAR'S passing the MERIDIAN throughout the YEAR.

	January.																	
	1		6		11		16		21		26		1		6		11	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
Algenib ...	5	17	4	56	4	34	4	12	3	51	3	30	3	5	2	46	2	26
Schedar ...	5	43	5	21	5	0	4	38	4	17	3	56	3	31	3	11	2	52
Polar Star.	6	10	5	48	5	27	5	5	4	44	4	23	3	58	3	38	3	18
Mirach....	6	13	5	51	5	30	5	8	4	47	4	26	4	1	3	41	3	21
Achernar ..	6	44	6	22	6	1	5	39	5	18	4	57	4	32	4	12	3	52
α ARIETIS...	7	10	6	48	6	27	6	5	5	44	5	23	4	58	4	38	4	18
Menkar ...	8	6	7	44	7	22	7	1	6	40	6	19	5	54	5	34	5	14
Algol	8	10	7	48	7	26	7	5	6	43	6	22	5	58	5	37	5	17
α Perseus...	8	24	8	3	7	41	7	20	6	58	6	37	6	13	5	52	5	32
ALDEBARAN	9	38	9	16	8	54	8	33	8	12	7	51	7	27	7	6	6	46
Capella....	10	16	9	54	9	32	9	11	8	49	8	29	8	4	7	44	7	24
Rigel	10	18	9	56	9	34	9	13	8	52	8	32	8	7	7	47	7	27
β Taurus....	10	27	10	5	9	44	9	22	9	1	8	40	8	16	7	56	7	36
Bellatrix ..	10	28	10	6	9	44	9	22	9	1	8	40	8	17	7	56	7	36
δ Orion.....	10	35	10	13	9	51	9	30	9	9	8	48	8	24	8	4	7	44
ε Orion.....	10	40	10	17	9	56	9	34	9	13	8	52	8	28	8	8	7	48
α Columba ..	10	46	10	24	10	2	9	40	9	19	8	58	8	34	8	14	7	54
Betelguese.	10	58	10	36	10	14	9	52	9	31	9	10	8	46	8	26	8	6
Canopus...	11	32	11	10	10	49	10	27	10	6	9	45	9	20	9	0	8	41
Sirius.....	11	50	11	28	11	6	10	44	10	23	10	2	9	37	9	17	8	58
Castor	12	36	12	14	11	52	11	30	11	9	10	48	10	23	10	3	9	43
Procyon...	12	42	12	20	11	58	11	37	11	16	10	55	10	30	10	10	9	50
POLLUX ...	12	47	12	25	12	3	11	41	11	20	10	59	10	34	10	14	9	54
ξ Argo Navis	13	10	12	48	12	25	12	4	11	43	11	22	10	57	10	37	10	17
γ Argo Navis	13	16	12	54	12	33	12	11	11	50	11	29	11	4	10	44	10	24
δ Argo Navis	13	52	13	30	13	8	12	47	12	25	12	4	11	40	11	20	11	0
β Argo Navis	14	23	14	1	13	39	13	18	12	57	12	36	12	11	11	51	11	31
Alphard...	14	30	14	8	13	46	13	26	13	4	12	44	12	19	11	59	11	39
REGULUS ..	15	10	14	48	14	26	14	5	13	45	13	24	12	59	12	39	12	19
β Ursa Major	16	2	15	41	15	18	13	57	14	36	14	16	13	51	13	31	13	11
Dubhe	16	4	15	42	15	20	14	59	14	37	14	17	13	53	13	32	13	12
Deneb.....	16	51	16	29	16	7	15	46	15	25	15	4	14	40	14	20	14	0
γ Ursa Major	16	56	16	34	16	12	15	50	15	29	15	8	14	44	14	24	14	4
α Crux	17	28	17	6	16	44	16	23	16	1	15	40	15	16	14	57	14	37
γ Crux	17	33	17	11	16	49	16	27	16	6	15	45	15	20	15	1	14	41
SPICA.....	18	27	18	5	17	43	17	22	17	1	16	39	16	15	15	55	15	35
Benetnach .	18	52	18	30	18	8	17	46	17	25	17	4	16	39	16	19	15	59
β Centaur ...	19	3	18	41	18	19	17	57	17	36	17	15	16	50	16	30	16	10
α Draco.....	19	11	18	49	18	27	18	6	17	44	17	23	16	59	16	38	16	18
Arcturus ..	19	19	18	56	18	35	18	13	17	52	17	31	17	6	16	46	16	26
Seginus ...	19	35	19	13	18	52	18	31	18	11	17	49	17	24	17	4	16	44
α Centaur...	19	38	19	16	18	56	18	34	18	13	17	52	17	27	17	7	16	47
Zubenesch .	19	51	19	29	19	7	18	47	18	25	18	5	17	40	17	20	17	0
Zubenelg ..	20	18	19	56	19	34	19	13	18	52	18	31	18	6	17	46	17	26
Alphacca ..	20	38	20	15	19	54	19	32	19	12	18	51	18	26	18	6	17	46
α Serpens ...	20	46	20	24	20	2	19	42	19	21	18	59	18	34	18	14	17	54
ANTARES ..	21	29	21	7	20	45	20	23	20	2	19	42	19	17	18	57	18	37
Ras Algethi	22	17	21	55	21	33	21	11	20	50	20	29	20	5	19	45	19	25
Ras Alhague	22	37	22	15	21	53	21	32	21	10	20	49	20	26	20	5	19	46
Rastaban..	23	3	22	41	22	19	21	57	21	36	21	15	20	50	20	29	20	11
Vega	23	41	23	19	22	57	22	36	22	15	21	54	21	29	21	10	20	50
α AQUILÆ ...	0	56	0	34	0	13	23	47	23	26	23	5	22	40	22	21	22	0
α Pavo	1	26	1	4	0	42	0	10	23	55	23	34	23	9	22	49	22	29
Deneb.....	1	50	1	28	1	6	0	44	0	23	0	2	23	33	23	13	22	54
Alderaimin.	2	29	2	7	1	45	1	23	1	2	0	41	0	16	23	52	23	33
α Aquarius..	3	10	2	48	2	27	2	6	1	44	1	23	0	59	0	38	0	18
α Grux	3	10	2	48	2	27	2	6	1	45	1	24	0	59	0	39	0	19
FOMALHAUT	4	1	3	39	3	17	2	56	2	35	2	14	1	50	1	29	1	10
Scheat	4	8	3	46	3	25	3	3	2	42	2	22	1	57	1	37	1	17
MARCAB...	4	9	3	47	3	25	3	4	2	43	2	23	1	58	1	38	1	18
Alpheratz..	5	13	4	51	4	29	4	7	3	46	3	25	3	0	2	41	2	21

	February.																	
	16		21		26		1		6		11		16		21		26	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
Algenib ...	2	6	1	47	1	28	1	8	0	49	0	30	0	10	23	51	23	32
Schedar ...	2	32	2	13	1	54	1	34	1	15	0	56	0	36	0	17	23	58
Polar Star.	2	59	2	40	2	21	2	1	1	42	1	23	1	3	0	44	0	25
Mirach....	3	2	2	43	2	24	2	4	1	45	1	26	1	6	0	47	0	28
Achernar ..	3	32	3	13	2	55	2	35	2	16	1	57	1	37	1	18	0	59
α ARIETIS...	3	58	3	39	3	20	3	0	2	41	2	22	2	2	1	43	1	24
Menkar ...	4	54	4	35	4	16	3	56	3	37	3	18	2	58	2	39	2	20
Algol	4	58	4	39	4	20	4	0	3	41	3	22	3	2	2	43	2	24
α Perseus...	5	32	5	13	4	54	4	34	4	15	3	56	3	36	3	17	2	58
ALDEBARAN	7	6	6	46	6	27	6	8	5	49	5	30	5	10	4	51	4	32
Capella....	7	24	7	5	6	46	6	27	6	8	5	49	5	29	5	10	4	51
Rigel	7	27	7	7	6	48	6	29	6	10	5	51	5	31	5	12	4	53
β Taurus....	7	36	7	16	6	57	6	38	6	19	6	0	5	40	5	21	5	2
Bellatrix ..	7	36	7	17	6	58	6	39	6	20	6	1	5	41	5	22	5	3
δ Orion.....	7	44	7	24	7	5	6	46	6	27	6	8	5	49	5	30	5	11
ε Orion.....	7	48	7	28	7	9	6	50	6	31	6	12	5	53	5	34	5	15
α Columba ..	7	54	7	35	7	15	6	56	6	37	6	18	5	59	5	40	5	21
Betelguese.	7	47	7	28	7	9	6	50	6	31	6	12	5	53	5	34	5	15
Canopus...	8	41	8	21	8	2	7	43	7	24	7	5	6	46	6	27	6	8
Sirius.....	8	58	8	39	8	19	8	0	7	41	7	22	7	3	6	44	6	25
Castor	9	43	9	23	9	5	8	46	8	27	8	8	7	49	7	30	7	11
Procyon...	9	50	9	30	9	12	8	53	8	33	8	14	7	55	7	36	7	17
POLLUX ...	9	54	9	35	9	16	8	57	8	38	8	19	8	0	7	41	7	22
ξ Argo Navis	10	17	9	58	9	38	9	20	9	1	8	42	8	23	8	4	7	45
γ Argo Navis	10	24	10	4	9	45	9	27	9	8	8	49	8	30	8	11	7	52
δ Argo Navis	11	11	10	40	10	21	10	2	9	43	9	24	9	5	8	46	8	27
β Argo Navis	11	51	11	31	11	12	10	52	10	33	10	14	9	55	9	36	9	17
Alphard...	11	59	11	39	11	19	11	0	10	41	10	22	10	3	9	44	9	25
REGULUS ..	12	39	12	19	11	59	11	40	11	21	11	2	10	43	10	24	10	5
β Ursa Major	13	31	13	11	12	51	12	32	12	13	11	54	11	35	11	16	10	57
Dubhe	13	32	13	12	12	53	12	34	12	15	11	56	11	37	11	18	10	59
Deneb.....	14	20	14	0	13	40	13	21	13	2	12	43	12	24	12	5	11	46
γ Ursa Major	14	24	14	4	13	45	13	25	13	6	12	47	12	28	12	9	11	50
α Crux	14	57	14	37	14	17	13	58	13	39	13	20	13	1	12	42	12	23
γ Crux	14	41	14	22	14	2	13	43	13	23	13	4	12	45	12	26	12	7
SPICA.....	15	35	15	16	14	57	14	38	14	19	14	0	13	41	13	22	13	3
Benetnach .	15	59	15	40	15	22	15	2	14	43	14	24	14	5	13	46	13	27
β Centaur ...	16	10	15	51	15	32	15	12	14	53	14	34	14	15	13	56	13	37
α Draco.....	16	18	15	59	15	40	15	21	15	2	14	43	14	24	14	5	13	46
Arcturus ..	16	26	16	7	15	48	15	29	15	10	14	51	14	32	14	13	13	54
Seginus ...	16	24	16	5	15	46	15	27	15	8	14	49	14	30	14	11	13	52
α Centaur...	16	27	16	8	15	49	15	30	15	11	14	52	14	33	14	14	13	55
Zubenesch .	16	40	16	21	16	2	15	43	15	24	15	5	14	46	14	27	14	8
Zubenelg ..	16	47	16	28	16	9	15	50	15	31	15	12	14	53	14	34	14	15
Alphacca ..	17	7	16	48	16	29	16	10	15	51	15	32	15	13	14	54	14	35
α Serpens ...	17	16	16	57	16	38	16	19	16	0	15	41	15	22	15	3	14	44
ANTARES ..	17	58	17	39	17	20	17	1	16	42	16	23	16	4	15	45	15	26
Ras Algethi	17	39	17	20	17	1	16	42	16	23	16	4	15	45	15	26	15	7
Ras Alhague	18	28	18	9	17	50	17	31	17	12	16	53	16	34	16	15	15	56
Rastaban..	19	14	18	55	18	36	18	17	17	58	17	39	17	20	17	1	16	42
Vega	19	52	19	33	19	14	18	55	18	36	18	17	17	58	17	39	17	20
α AQUILÆ ...	22	40	22	21	22	1	21	41	21	22	21	3	20	44	20	25	20	6
α Pavo	23	9	22	49	22	29	22	10	21	50	21	31	21	12	20	53	20	34
Deneb.....	23	33	23	13	22	54	22	34	22	14	21	55	21	36	21	17	20	58
Alderaimin.	0	16	23	52	23	33	23	13	22	53	22	34	22	14	21	55	21	36
α Aquarius..	0	59	0	38	0	18	23	55	23	36	23	17	22	57	22	38	22	19
α Grux	0	59	0	39	0	19	23	55	23	36	23	17	22	57	22	38	22	19
FOMALHAUT	1	50	1	29	1	10	0	50	0	31	0	12	23	53	23	33	23	14
Scheat	1	57	1	37	1	17	0	57	0	38	0	19	23	59	23	40	23	21
MARCAB...	1	58	1	38	1	18	0	58	0	39	0	20	0	0	23	41	23	22
Alpheratz..	3	0	2	41	2	21	2	1	1	42	1	23	1	3	0	44	0	25

TABLE XVI.

For finding the APPARENT TIME of the PRINCIPAL STAR'S passing the MERIDIAN throughout the YEAR.

	March.																	
	1		6		11		16		21		26		1		6		11	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
Algenib ...	1	16	0	57	0	39	0	21	0	2	23	40	23	18	23	1	22	43
Schedar ...	1	42	1	24	1	5	0	47	0	29	0	11	23	45	23	26	23	8
Polar Star.	2	9	1	50	1	32	1	14	0	55	0	37	0	15	23	53	23	35
Mirach....	2	12	1	53	1	34	1	16	0	58	0	40	0	18	23	56	23	37
Achernar ..	2	43	2	24	2	6	1	48	1	29	1	11	0	49	0	31	0	13
α ARIETIS ...	3	9	2	50	2	32	2	14	1	55	1	37	1	15	0	57	0	39
Menkar ...	4	4	3	45	3	27	3	9	2	51	2	33	2	11	1	53	1	35
Algol	4	7	3	49	3	30	3	13	2	55	2	37	2	15	1	57	1	38
α Perseus...	4	22	4	4	3	45	3	28	3	10	2	52	2	30	2	12	1	53
ALDEBARAN	5	37	5	18	4	59	4	41	4	23	4	5	3	43	3	25	3	7
Capella....	6	14	5	56	5	37	5	19	5	1	4	43	4	21	4	3	3	44
Rigel	6	17	5	58	5	40	5	21	5	3	4	45	4	23	4	5	3	47
β Taurus....	6	26	6	7	5	49	5	30	5	12	4	54	4	32	4	14	3	56
Bellatrix ..	6	26	6	8	5	49	5	31	5	13	4	55	4	33	4	16	3	56
ϑ Orion.....	6	34	6	15	5	57	5	38	5	20	5	2	4	40	4	22	4	4
ε Orion.....	6	38	6	19	6	1	5	43	5	24	5	6	4	44	4	26	4	8
α Columba ..	6	44	6	25	6	7	5	49	5	30	5	12	4	51	4	32	4	14
Betelguese .	6	56	6	38	6	19	6	1	5	43	5	25	5	3	5	45	4	26
Canopus ...	7	31	7	12	6	54	6	35	6	17	5	59	5	37	5	19	5	1
Sirius.....	7	48	7	29	7	11	6	53	6	35	6	16	5	55	5	36	5	18
Castor	8	34	8	15	7	57	7	39	7	20	7	2	6	40	6	22	6	4
Procyon ...	8	41	8	22	8	4	7	45	7	27	7	9	6	47	6	29	6	11
POLLUX ...	8	45	8	27	8	8	7	50	7	32	7	13	6	52	6	33	6	15
ξ Argo Navis	9	8	8	50	8	31	8	13	7	55	7	36	7	15	6	56	6	38
γ Argo Navis	9	15	8	56	8	38	8	20	8	1	7	43	7	21	7	3	6	45
ϑ Argo Navis	9	50	9	32	9	14	8	55	8	37	8	19	7	57	7	39	7	21
β Argo Navis	10	21	10	3	9	44	9	27	9	9	8	50	8	29	8	10	7	52
Alphard ...	10	29	10	10	9	52	9	34	9	16	8	58	8	36	8	18	8	0
REGULUS ..	11	9	10	50	10	32	10	13	9	56	9	38	9	16	8	58	8	40
β Ursa Major	12	1	11	42	11	24	11	5	10	47	10	29	10	7	9	50	9	32
Dubhe	12	2	11	44	11	25	11	7	10	49	10	31	10	9	9	52	9	33
Deneb.....	12	50	12	31	12	13	11	54	11	36	11	18	10	56	10	38	10	20
γ Ursa Major	12	54	12	36	12	17	11	59	11	41	11	22	11	1	10	42	10	24
α Crux	13	27	13	8	12	50	12	31	12	13	11	55	11	33	11	15	10	57
γ Crux	13	31	13	13	12	54	12	36	12	18	11	59	11	38	11	19	11	1
SPICA.....	14	26	14	7	13	49	13	30	13	12	12	54	12	32	12	14	11	56
Benetnach .	14	50	14	32	14	13	13	55	13	37	13	19	12	57	12	39	12	20
β Centaur ...	15	1	14	42	14	24	14	6	13	48	13	29	13	8	12	49	12	31
α Draco.....	15	9	14	51	14	32	14	14	13	56	13	38	13	16	12	58	12	39
Arcturus ..	15	17	14	59	14	40	14	22	14	4	13	46	13	24	13	6	12	47
Seginus ...	15	35	15	16	14	57	14	39	14	21	14	3	13	41	13	23	13	5
α Centaur...	15	38	15	19	15	0	14	43	14	24	14	6	13	44	13	26	13	8
Zubenesch .	15	51	15	32	15	13	14	55	14	37	14	19	13	57	13	39	13	21
Zubenelg ..	16	16	15	59	15	39	15	22	15	4	14	45	14	24	14	5	13	47
Alphacca ..	16	36	16	17	15	59	15	42	15	23	15	5	14	44	14	25	14	7
α Serpens ...	16	44	16	26	16	7	15	50	15	32	15	14	14	52	14	34	14	15
ANTARES ..	17	27	17	9	16	50	16	32	16	15	15	57	15	35	15	17	14	58
Ras Algethi	18	15	17	57	17	38	17	20	17	2	16	44	16	23	16	5	15	46
Ras Alhague	18	35	18	17	17	58	17	40	17	22	17	4	16	41	16	25	16	6
Rastaban ..	19	1	18	43	18	24	18	6	17	48	17	30	17	8	16	50	16	31
Vega	19	48	19	21	19	3	18	44	18	26	18	8	17	46	17	28	17	10
α AQUILÆ ...	20	51	20	32	20	14	19	56	19	37	19	19	18	57	18	39	18	21
α Pavo	21	20	21	2	20	43	20	25	20	7	19	48	19	27	19	8	18	50
Deneb.....	21	44	21	26	21	7	20	49	20	31	20	12	19	51	19	32	19	14
Alderaimin.	22	23	22	5	21	45	21	28	21	10	20	51	20	30	20	11	19	53
α Aquarius..	23	4	22	46	22	27	22	10	21	52	21	34	21	12	20	54	20	35
α Grux	23	5	22	46	22	28	22	10	21	52	21	34	21	12	20	54	20	36
FOMALHAUT	23	56	23	37	23	19	23	1	22	43	22	25	22	3	21	45	21	27
Scheat	0	7	23	44	23	26	23	8	22	50	22	32	22	10	21	52	21	34
MARCAB...	0	8	23	45	23	27	23	8	22	51	22	33	22	10	21	53	21	35
Alpheratz..	1	11	0	52	0	34	0	16	23	53	23	35	23	13	22	56	22	38

	April.																	
	16		21		26		1		6		11		16		21		26	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
Algenib ...	22	24	22	6	21	47	21	28	21	9	20	50	20	31	20	12	19	53
Schedar ...	22	50	22	32	22	13	21	55	21	36	21	17	20	58	20	39	20	20
Polar Star.	23	16	22	58	22	39	22	20	22	1	21	42	21	23	21	4	20	45
Mirach....	23	19	23	1	22	42	22	23	22	4	21	45	21	26	21	7	20	48
Achernar ..	23	50	23	32	23	13	22	54	22	35	22	16	21	57	21	38	21	19
α ARIETIS ...	23	58	23	39	23	20	23	1	22	42	22	23	22	4	21	45	21	26
Menkar ...	1	36	1	16	0	58	0	39	0	20	0	1	23	42	23	23	23	4
Algol	1	57	1	38	1	20	1	1	0	43	0	24	0	5	23	46	23	27
α Perseus...	1	35	1	16	0	58	0	39	0	20	0	1	23	42	23	23	23	4
ALDEBARAN	3	7	2	49	2	30	2	12	1	53	1	34	1	15	0	56	0	37
Capella....	3	44	3	26	3	8	2	50	2	32	2	13	1	54	1	36	1	17
Rigel	3	47	3	28	3	11	2	52	2	34	2	15	1	56	1	38	1	19
β Taurus....	3	56	3	37	3	19	3	1	2	43	2	24	2	5	1	47	1	28
Bellatrix ..	3	56	3	38	3	19	3	2	2	44	2	25	2	6	1	48	1	29
ϑ Orion.....	4	4	3	45	3	27	3	9	2	51	2	33	2	14	1	55	1	37
ε Orion.....	4	8	3	49	3	31	3	12	2	54	2	36	2	17	1	58	1	40
α Columba ..	4	14	3	56	3	37	3	18	3	0	2	41	2	23	2	4	1	45
Betelguese .	4	26	4	8	3	49	3	31	3	12	2	53	2	35	2	16	1	57
Canopus ...	5	45	4	26	4	8	3	49	3	31	3	12	2	53	2	35	2	16
Sirius.....	5	36	5	18	5	0	4	41	4	24	4	5	3	46	3	28	3	9
Castor	6	22	6	4	5	46	5	27	5	8	4	49	4	30	4	12	3	53
Procyon ...	6	29	6	11	5	52	5	34	5	15	4	56	4	37	4	19	4	0
POLLUX ...	6	33	6	15	5	57	5	38	5	19	5	0	4	41	4	22	4	3
ξ Argo Navis	6	56	6	38	6	20	6	1	5	42	5	23	5	4	4	45	4	26
γ Argo Navis	7	3	6	45	6	26	6	8	5	49	5	30	5	11	4	52	4	33
ϑ Argo Navis	7	39	7	21	7	2	6	44	6	25	6	7	5	48	5	29	5	10
β Argo Navis	8	50	8	32	8	13	7	55	7	36	7	17	6	58	6	39	6	20
Alphard ...	8	58	8	41	8	23	8	4	7	45	7	26	7	7	6	48	6	29
REGULUS ..	9	38	9	21	9	3	8	44	8	25	8	6	7	47	7	28	7	9
β Ursa Major	10	29	10	12	9	54	9	35	9	16	8	57	8	38	8	19	8	0
Dubhe	10	31	10	13	9	55	9	36	9	17	8	58	8	39	8	20	8	1
Deneb.....	11	18	11	0	10	42	10	23	10	4	9	45	9	26	9	7	8	48
γ Ursa Major	11	22	11	4	10	46	10	27	10	8	9	49	9	30	9	11	8	52
α Crux	11	55	11	37	11	18	10	59	10	40	10	21	10	2	9	43	9	24
γ Crux	11	59	11	41	11	22	11	3	10	44	10	25	10	6	9	47	9	28
SPICA.....	12	54	12	36	12	17	11	58	11	39	11	20	11	1	10	42	10	23
Benetnach .	13	19	13	1	12	42	12	23	12	4	11	45	11	26	11	7	10	48
β Centaur ...	13	29	13	11	12	52	12	33	12	14	11	55	11	36	11	17	10	58
α Draco.....	13	38	13	20	13	1	12	42	12	23	12	4	11	45	11	26	11	7
Arcturus ..	13	46	13	28	13	9	12	50	12	31	12	12	11	53	11	34	11	15
Seginus ...	13	5	12	46	12	28	12	9	11	50	11	31	11	12	10	53	10	34
α Centaur...	13	8	12	49	12	31	12	12	11	53	11	34	11	15	10	56	10	37
Zubenesch .	13	21	13	2	12	44	12	25	12	6	11	47	11	28	11	9	10	50
Zubenelg ..	13	47	13	29	13	10	12	51	12	32	12	13	11	54	11	35	11	16
Alphacca ..	14	7	13	48	13	30	13	11	12	52	12	33	12	14	11	55	11	36
α Serpens ...	14	15	13	57	13	38	13	20	13	1	12	42	12	23	12	4	11	45
ANTARES ..	14	58	14	40	14	21	14	2	13	43	13	24	13	5	12	46	12	27
Ras Algethi	15	46	15	28	15	9	14	51	14	32	14	13	13	54	13	35	13	16
Ras Alhague	16	6	15	48	15	29	15	11	14	52	14	33	14	14	13	55	13	36
Rastaban ..	16	31	16	13	15	55	15	37	15	18	14	59	14	40	14	21	14	2
Vega	17	10	16	51	16	33	16	14	15	55	15	36	15	17	14	58	14	39
α AQUILÆ ...	18	39	18	21	18	2	17	44	17	25	17	6	16	47	16	28	16	9
α Pavo	18	50	18	32	18	13	17	54	17	35	17	16	16	57	16	38	16	19
Deneb.....	19	14	18	56	18	37	18	18	17	59	17	40	17	21	17	2	16	43
Alderaimin.	20	11	19	53	19	35	19	16	18	57	18	38	18	19	18	0	17	41
α Aquarius..	20	35	20	17	19	58	19	40	19	21	19	2	18	43	18	24	18	5
α Grux	20	36	20	17	19	59	19	40	19	21	19	2	18	43	18	24	18	5
FOMALHAUT	21	45	21	27	21	8	20	50	20	31	20	12	19	53	19	34	19	15
Scheat	21	52	21	34	21	15	20	57	20	38	20	19	20	0	19	41	19	22
MARCAB...	21	53	21	35	21	16	20	58	20	39	20	20	20	1	19	42	19	23
Alpheratz..	22	56	22	38	22	20	22	1	21	42	21	23	21	4	20	45	20	26

TABLE XVI.

For finding the APPARENT TIME of the PRINCIPAL STAR'S passing the MERIDIAN throughout the YEAR.

	May.												June.									
	1		6		11		16		21		26		1		6		11		16		21		26	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
Algenib ...	21	28	21	9	20	50	20	30	20	10	19	50	19	26	19	5	18	44	18	24	18	3	17	42
Schedar ...	21	54	21	34	21	16	20	56	20	36	20	16	19	52	19	31	19	11	18	50	18	29	18	8
Polar Star .	22	20	22	1	21	42	21	22	21	2	20	43	20	19	19	58	19	37	19	17	18	56	18	35
Mirach....	22	23	22	4	21	44	21	25	21	5	20	46	20	20	20	1	19	40	19	19	18	58	18	38
Achernar ..	22	54	22	35	22	16	21	56	21	36	21	16	20	52	20	31	20	11	19	51	19	30	19	9
α ARIETIS...	23	20	23	1	22	42	22	22	22	2	21	42	21	18	20	57	20	36	20	17	19	56	19	35
Menkar ...	0	20	0	1	23	37	23	18	22	58	22	38	22	13	21	53	21	32	21	11	20	51	20	30
Algol	0	24	0	4	23	41	23	21	23	2	22	41	22	17	21	56	21	36	21	15	20	54	20	33
α Perseus...	0	39	0	20	23	56	23	36	23	17	22	56	22	32	22	12	21	51	21	30	21	9	20	49
ALDEBARAN	1	53	1	34	1	14	0	55	0	35	0	15	23	46	23	26	23	5	22	44	22	23	22	3
Capella....	2	31	2	11	1	52	1	32	1	12	0	52	0	28	0	7	23	43	23	22	23	1	22	40
Rigel	2	33	2	14	1	54	1	35	1	15	0	55	0	30	0	10	23	45	23	24	23	4	22	43
β Taurus....	2	42	2	23	2	4	1	44	1	24	1	4	0	39	0	19	23	54	23	33	23	13	22	52
Bellatrix ..	2	43	2	23	2	4	1	44	1	25	1	4	0	40	0	19	23	55	23	34	23	13	22	52
ε Orion.....	2	50	2	31	2	11	1	52	1	32	1	12	0	47	0	27	0	6	23	41	23	21	23	0
ε Orion.....	2	54	2	35	2	16	1	56	1	36	1	16	0	52	0	31	0	10	23	46	23	25	23	4
α Columba ..	3	0	2	41	2	22	2	2	1	42	1	22	0	58	0	37	0	16	23	52	23	31	23	10
Betelguese .	3	11	2	53	2	34	2	14	1	54	1	34	1	10	0	49	0	29	0	8	23	43	23	22
Canopus ...	3	46	3	27	3	9	2	49	2	29	2	9	1	44	1	24	1	3	0	43	0	22	0	1
Sirius.....	4	3	3	44	3	25	3	6	2	46	2	26	2	2	1	41	1	21	1	0	0	39	0	18
Castor	4	49	4	30	4	11	3	51	3	31	3	11	2	48	2	27	2	6	1	46	1	25	1	4
Procyon ...	4	56	4	37	4	17	3	58	3	38	3	18	2	54	2	34	2	13	1	52	1	32	1	11
POLLUX ...	5	0	4	41	4	22	4	2	3	42	3	22	2	59	2	38	2	18	1	57	1	36	1	15
ξ Argo Navis	5	23	5	4	4	45	4	25	4	5	3	45	3	21	3	0	2	41	2	20	1	59	1	38
γ Argo Navis	5	30	5	11	4	52	4	32	4	12	3	52	3	28	3	7	2	47	2	27	2	6	1	45
ι Argo Navis	6	6	5	47	5	27	5	8	4	48	4	28	4	3	3	43	3	22	3	1	2	42	2	21
β Argo Navis	6	37	6	18	5	59	5	39	5	19	4	59	4	35	4	14	3	54	3	33	3	12	2	51
Alphard ...	6	45	6	26	6	6	5	47	5	27	5	7	4	42	4	22	4	1	3	40	3	20	2	59
REGULUS ..	7	25	7	6	6	46	6	27	6	7	5	47	5	22	5	2	4	41	4	20	4	0	3	39
β Ursa Major	8	17	7	58	7	38	7	19	6	59	6	39	6	14	5	54	5	33	5	12	4	52	4	31
Dubhe	8	19	8	0	7	40	7	20	7	1	6	40	6	16	5	56	5	35	5	14	4	53	4	33
Deneb.....	9	6	8	47	8	27	8	8	7	48	7	28	7	3	6	43	6	22	6	1	5	41	5	20
γ Ursa Major	9	10	8	51	8	32	8	12	7	52	7	32	7	8	6	47	6	27	6	6	5	45	5	24
α Crux	9	42	9	23	9	4	8	45	8	25	8	5	7	40	7	20	6	59	6	38	6	17	5	57
γ Crux	9	46	9	27	9	9	8	49	8	29	8	9	7	45	7	21	7	4	6	43	6	22	6	1
SPICA....	10	41	10	22	10	2	9	43	9	23	9	3	8	39	8	18	7	58	7	37	7	17	6	56
Benetnach .	11	6	10	46	10	27	10	8	9	47	9	27	9	3	8	43	8	23	8	2	7	41	7	20
β Centaur ..	11	16	10	57	10	38	10	18	9	58	9	38	9	14	8	55	8	34	8	13	7	52	7	31
α Draco	11	25	11	6	10	46	10	26	10	7	9	46	9	22	9	2	8	41	8	21	8	0	7	40
Arcturus ..	11	33	11	13	10	54	10	34	10	14	9	54	9	30	9	10	8	49	8	29	8	8	7	47
Seginus ...	11	50	11	31	11	11	10	52	10	32	10	12	9	47	9	27	9	6	8	46	8	26	8	5
α Centaur...	11	53	11	34	11	15	10	55	10	35	10	15	9	51	9	30	9	9	8	49	8	29	8	8
Zubenesch .	12	6	11	47	11	27	11	3	10	48	10	28	10	3	9	43	9	22	9	1	8	42	8	21
Zubenelg ..	12	33	12	13	11	54	11	34	11	14	10	54	10	30	10	9	9	49	9	28	9	7	8	46
Alphacca ..	12	52	12	33	12	14	11	54	11	34	11	14	10	50	10	29	10	8	9	48	9	27	9	6
α Serpens ...	13	1	12	41	12	22	12	2	11	42	11	22	10	58	10	37	10	17	9	56	9	35	9	14
ANTARES ..	13	44	13	24	13	5	12	45	12	25	12	5	11	41	11	20	11	0	10	39	10	18	9	57
Ras Algethi	14	32	14	12	13	53	13	33	13	13	12	53	12	29	12	8	11	48	11	27	11	6	10	45
Ras Alhague	14	52	14	33	14	13	13	54	13	34	13	14	12	49	12	29	12	8	11	47	11	26	11	6
Rastaban ..	15	18	14	58	14	39	14	19	13	59	13	39	13	15	12	54	12	34	12	13	11	52	11	31
Vega	15	55	15	36	15	17	14	58	14	38	14	18	13	53	13	33	13	12	12	51	12	31	12	10
α AQUILÆ ...	17	6	16	47	16	28	16	8	15	48	15	28	15	4	14	43	14	23	14	3	13	42	13	21
α Pavo	17	36	17	16	16	57	16	37	16	17	15	57	15	33	15	12	14	52	14	31	14	11	13	50
Deneb.....	17	59	17	40	17	21	17	1	16	41	16	21	15	57	15	36	15	16	14	55	14	34	14	14
Alderamin.	18	38	18	19	18	0	17	40	17	20	17	0	16	36	16	15	15	55	15	34	15	13	14	52
α Aquarius..	19	21	19	2	18	42	18	22	18	3	17	42	17	18	16	58	16	37	16	16	15	55	15	35
α Crux	19	21	19	2	18	42	18	23	18	3	17	43	17	18	16	58	16	37	16	16	15	56	15	35
FOMALHAUT	20	12	19	53	19	33	19	14	18	54	18	34	18	9	17	49	17	28	17	7	16	46	16	26
Scheat	20	19	20	0	19	41	19	21	19	1	18	41	18	17	17	56	17	35	17	15	16	54	16	33
MARCAB...	20	20	20	1	19	41	19	22	19	2	18	42	18	17	17	57	17	36	17	15	16	55	16	34
Alpheratz..	21	23	21	4	20	45	20	25	20	5	19	45	19	21	19	0	18	39	18	19	17	58	17	37

TABLE XVI.

For finding the APPARENT TIME of the PRINCIPAL STAR'S passing the MERIDIAN throughout the YEAR.

	July.												August.											
	1		6		11		16		21		26		1		6		11		16		21		26	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
Algenib	17	21	17	1	16	40	16	20	16	0	15	40	15	17	14	58	14	39	14	20	14	2	13	43
Schedar	17	48	17	27	17	6	16	46	16	26	16	6	15	43	15	24	15	5	14	47	14	28	14	9
Polar Star	18	14	17	54	17	33	17	13	16	53	16	33	16	9	15	50	15	32	15	13	14	55	14	36
Mirach	18	17	17	56	17	36	17	15	16	55	16	36	16	12	15	53	15	35	15	16	14	57	14	39
Achernar	18	48	18	28	18	7	17	47	17	27	17	7	16	43	16	24	16	6	15	47	15	29	15	10
α Arietis	19	14	18	54	18	33	18	13	17	53	17	33	17	9	16	50	16	31	16	12	15	55	15	36
Menkar	20	10	19	50	19	29	19	9	18	49	18	29	18	5	17	46	17	27	17	8	16	49	16	31
Algol	20	14	19	53	19	33	19	12	18	52	18	33	18	9	17	50	17	30	17	12	16	53	16	35
α Perseus	20	29	20	8	19	48	19	27	19	7	18	47	18	24	18	5	17	46	17	27	17	8	16	50
Aldebaran	21	42	21	21	21	1	20	41	20	21	20	1	19	38	19	19	19	0	18	41	18	22	18	4
Capella	22	20	21	59	21	39	21	18	20	59	20	39	20	16	19	56	19	37	19	19	19	0	18	42
Rigel	22	22	22	2	21	41	21	21	21	2	20	42	20	18	19	59	19	40	19	21	19	2	18	44
β Taurus	22	31	22	11	21	50	21	30	21	10	20	51	20	27	20	8	19	49	19	30	19	11	18	53
Bellatrix	22	32	22	11	21	51	21	30	21	10	20	51	20	28	20	9	19	49	19	31	19	12	18	54
δ Orion	22	39	22	18	21	58	21	38	21	18	20	58	20	35	20	16	19	57	19	38	19	19	19	1
ε Orion	22	43	22	23	22	2	21	42	21	22	21	2	20	39	20	20	20	1	19	42	19	24	19	5
α Columba	22	49	22	29	22	8	21	48	21	28	21	8	20	46	20	26	20	7	19	48	19	30	19	11
Betelguese	23	2	22	41	22	21	22	0	21	40	21	20	20	58	20	39	20	19	20	1	19	42	19	24
Canopus	23	36	23	16	22	55	22	35	22	15	21	55	21	32	21	13	20	54	20	35	20	17	19	58
Sirius	23	53	23	33	23	12	22	52	22	32	22	12	21	50	21	30	21	11	20	52	20	34	20	15
Castor	0	43	0	23	0	2	23	38	23	18	22	58	22	34	22	15	21	56	21	38	21	20	21	1
Procyon	0	50	0	30	0	9	23	45	23	25	23	5	22	41	22	22	22	3	21	45	21	26	21	8
Pollux	0	55	0	34	0	13	23	49	23	29	23	9	22	46	22	26	22	7	21	50	21	31	21	12
ξ Argo Navis	1	18	0	57	0	36	0	16	23	52	23	32	23	9	22	49	22	30	22	12	21	54	21	35
γ Argo Navis	1	24	1	4	0	43	0	23	0	3	23	39	23	15	22	56	22	37	22	19	22	1	21	42
δ Argo Navis	2	0	1	39	1	19	0	59	0	38	0	19	23	51	23	32	23	13	22	54	22	36	22	18
β Argo Navis	2	31	2	11	1	50	1	30	1	10	0	50	0	27	0	7	23	44	23	25	23	7	22	49
Alphard	2	39	2	18	1	58	1	38	1	18	0	58	0	34	0	15	23	52	23	33	23	14	22	56
Regulus	3	18	2	58	2	38	2	18	1	58	1	38	1	14	0	55	0	36	0	17	23	54	23	36
β Ursa Major	4	10	3	50	3	29	3	10	2	50	2	30	2	6	1	47	1	28	1	9	0	51	0	32
Dubhe	4	12	3	51	3	31	3	11	2	51	2	31	2	8	1	49	1	30	1	11	0	52	0	34
Deneb	4	59	4	39	4	18	3	58	3	38	3	18	2	55	2	36	2	17	1	58	1	39	1	21
γ Ursa Major	5	4	4	43	4	22	4	2	3	42	3	22	3	0	2	40	2	21	2	3	1	44	1	26
α Crux	5	36	5	15	4	55	4	35	4	14	3	55	3	31	3	12	2	54	2	35	2	17	1	58
γ Crux	5	40	5	20	4	59	4	39	4	19	3	59	3	36	3	16	2	58	2	39	2	21	2	2
Spica	6	35	6	14	5	54	5	34	5	13	4	54	4	30	4	11	3	52	3	33	3	15	2	57
Benetnach	7	0	6	39	6	19	5	58	5	38	5	18	4	55	4	36	4	16	3	58	3	39	3	22
β Centaur	7	10	6	50	6	29	6	9	5	49	5	29	5	6	4	46	4	27	4	8	3	50	3	31
α Draco	7	19	6	58	6	38	6	17	5	57	5	37	5	14	4	55	4	36	4	17	3	58	3	40
Arcturus	7	27	7	6	6	46	6	25	6	5	5	45	5	22	5	3	4	43	4	25	4	6	3	48
Seginus	7	44	7	23	7	3	6	43	6	23	6	3	5	39	5	20	5	1	4	42	4	23	4	5
α Centaur	7	47	7	27	7	6	6	46	6	26	6	6	5	42	5	23	5	4	4	45	4	27	4	8
Zubenesch	8	0	7	39	7	19	6	59	6	39	6	19	5	55	5	36	5	17	4	58	4	39	4	21
Zubenelg	8	27	8	6	7	45	7	25	7	5	6	45	6	22	6	2	5	43	5	25	5	6	4	47
Alphacca	8	46	8	26	8	5	7	45	7	25	7	5	6	41	6	22	6	3	5	44	5	26	5	7
α Serpens	8	55	8	34	8	14	7	53	7	33	7	13	6	50	6	30	6	11	5	53	5	34	5	16
Antares	9	37	9	16	8	57	8	36	8	16	7	56	7	33	7	13	6	54	6	36	6	17	5	59
Ras Algethi	10	25	10	5	9	44	9	23	9	4	8	44	8	21	8	2	7	42	7	24	7	5	6	47
Ras Alhague	10	45	10	24	10	4	9	43	9	23	9	3	8	41	8	22	8	3	7	44	7	25	7	7
Rastaban	11	11	10	50	10	30	10	9	9	49	9	29	9	7	8	48	8	28	8	10	7	51	7	33
Vega	11	49	11	28	11	8	10	48	10	28	10	8	9	44	9	26	9	7	8	48	8	29	8	11
α Aquilæ	13	0	12	40	12	19	11	59	11	39	11	19	10	55	10	36	10	17	9	59	9	41	9	22
α Pavo	13	30	13	9	12	48	12	28	12	8	11	48	11	25	11	5	10	46	10	28	10	9	9	51
Deneb	13	54	13	33	13	12	12	52	12	32	12	12	11	49	11	29	11	10	10	51	10	33	10	14
Alderaimin	14	33	14	12	13	51	13	31	13	11	12	51	12	28	12	8	11	49	11	30	11	12	10	53
α Aquarius	15	14	14	53	14	34	14	13	13	53	13	33	13	10	12	51	12	32	12	13	11	54	11	36
α Grux	15	14	14	53	14	34	14	14	13	54	13	34	13	10	12	51	12	32	12	13	11	54	11	36
Fomalhaut	16	5	15	44	15	24	15	5	14	44	14	25	14	1	13	42	13	23	13	4	12	45	12	27
Schent	16	12	15	52	15	31	15	11	14	52	14	32	14	8	13	49	13	30	13	11	12	53	12	34
Marcab	16	13	15	52	15	32	15	12	14	53	14	33	14	9	13	50	13	31	13	12	12	53	12	35
Alpheratz	17	16	16	56	16	35	16	15	15	55	15	35	15	12	14	53	14	34	14	15	13	57	13	38

TABLE XVI.

For finding the APPARENT TIME of the PRINCIPAL STAR'S passing the MERIDIAN throughout the YEAR.

	September.										October.									
	1		6		11		16		21		26		1		6		11		16		21		26	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
Algenib ...	13	21	13	3	12	45	12	27	12	9	11	51	11	33	11	15	10	57	10	38	10	19	10	0
Schedar ...	13	48	13	30	13	10	12	54	12	36	12	18	12	0	11	41	11	23	11	4	10	46	10	27
Polar Star .	14	14	13	56	13	37	13	20	13	2	12	44	12	26	12	8	11	50	11	31	11	12	10	53
Mirach	14	17	14	0	13	40	13	23	13	5	12	47	12	29	12	11	11	52	11	34	11	15	10	56
Achernar ..	14	48	14	30	14	12	13	54	13	36	13	18	13	0	12	42	12	24	12	5	11	46	11	27
α ARIETIS ...	15	14	14	56	14	38	14	20	14	2	13	44	13	26	13	8	12	50	12	31	12	12	11	53
Menkar ...	16	10	15	52	15	34	15	16	14	58	14	40	14	22	14	4	13	46	13	27	13	8	12	49
Algol	16	14	15	56	15	38	15	20	15	2	14	44	14	26	14	7	13	49	13	31	13	12	12	53
α Perseus ...	16	29	16	11	15	53	15	35	15	17	14	59	14	41	14	23	14	4	13	46	13	27	13	8
ALDEBARAN	17	42	17	24	17	6	16	49	16	31	16	13	15	55	15	37	15	18	15	0	14	41	14	22
Capella	18	20	18	2	17	44	17	26	17	9	16	50	16	33	16	14	15	56	15	38	15	19	15	0
Rigel	18	22	18	4	17	46	17	28	17	10	16	52	16	35	16	17	16	0	15	40	15	21	15	2
β Taurus	18	31	18	13	17	55	17	37	17	19	17	1	16	44	16	26	16	8	15	49	15	30	15	11
Bellatrix ..	18	32	18	14	17	56	17	38	17	20	17	2	16	45	16	26	16	8	15	50	15	31	15	12
ϑ Orion	18	39	18	21	18	3	17	45	17	27	17	9	16	51	16	34	16	15	15	57	15	38	15	19
ε Orion	18	43	18	25	18	7	17	49	17	31	17	13	16	55	16	37	16	20	16	1	15	42	15	23
α Columba ..	18	49	18	31	18	13	17	55	17	37	17	19	17	1	16	43	16	26	16	7	15	48	15	29
Betelguese .	19	2	18	44	18	26	18	8	17	50	17	32	17	14	16	55	16	37	16	20	16	0	15	42
Canopus ...	19	36	19	18	19	0	18	42	18	24	18	6	17	48	17	30	17	12	16	53	16	34	16	15
Sirius	19	53	19	35	19	17	18	59	18	41	18	23	18	5	17	47	17	29	17	10	16	52	16	32
Castor	20	39	20	21	20	3	19	45	19	27	19	9	18	51	18	33	18	15	17	57	17	37	17	18
Procyon ...	20	46	20	28	20	10	19	52	19	34	19	16	18	58	18	40	18	22	18	4	17	44	17	25
POLLUX ...	20	51	20	32	20	14	19	56	19	39	19	21	19	2	18	44	18	27	18	7	17	49	17	30
ξ Argo Navis	21	14	20	55	20	37	20	19	20	1	19	44	19	25	19	7	18	49	18	30	18	12	17	53
γ Argo Navis	21	20	21	2	20	44	20	26	20	8	19	50	19	32	19	14	18	56	18	37	18	18	18	0
δ Argo Navis	21	56	21	38	21	20	21	2	20	44	20	26	20	8	19	50	19	31	19	13	18	54	18	35
β Argo Navis	22	26	22	9	21	51	21	33	21	15	20	57	20	39	20	21	20	3	19	44	19	26	19	6
Alphard ...	22	34	22	17	22	0	21	41	21	23	21	5	20	47	20	29	20	10	19	52	19	33	19	14
REGULUS ..	23	14	22	57	22	39	22	21	22	3	21	45	21	27	21	9	20	50	20	32	20	13	19	54
β Ursa Major	0	10	23	48	23	30	23	12	22	55	22	37	22	19	22	1	21	43	21	24	21	5	20	46
Dubhe	0	12	23	50	23	32	23	14	22	57	22	39	22	21	22	3	21	44	21	26	21	7	20	48
Deneb	0	59	0	41	0	23	0	5	23	43	23	25	23	8	22	50	22	32	22	13	21	54	21	35
γ Ursa Major	1	4	0	45	0	27	0	10	23	48	23	30	23	12	22	54	22	36	22	17	22	0	21	40
α Crux	1	36	1	18	1	0	0	42	0	24	0	6	23	44	23	26	23	8	22	50	22	31	22	12
γ Crux	1	40	1	22	1	4	0	46	0	28	0	10	23	48	23	30	23	12	22	54	22	36	22	16
SPICA	2	35	2	17	1	59	1	41	1	23	1	5	0	47	0	29	0	10	23	48	23	30	23	10
Benetnach .	3	0	2	42	2	24	2	6	1	48	1	30	1	12	0	53	0	35	0	17	23	54	23	35
β Centaur ...	3	10	2	52	2	34	2	16	1	58	1	40	1	22	1	4	0	46	0	27	0	9	23	45
α Draco	3	19	3	1	2	43	2	25	2	7	1	49	1	31	1	13	0	54	0	36	0	17	23	54
Arcturus ..	3	26	3	9	2	51	2	33	2	15	1	57	1	39	1	20	1	2	0	44	0	25	0	6
Seginus ...	3	43	3	26	3	8	2	50	2	32	2	14	1	56	1	38	1	19	1	1	0	42	0	23
α Centaur ...	3	46	3	29	3	11	2	53	2	35	2	17	1	59	1	41	1	23	1	4	0	45	0	26
Zubenesch .	3	59	3	41	3	24	3	6	2	48	2	30	2	12	1	54	1	35	1	17	0	58	0	39
Zubenelg ..	4	26	4	7	3	49	3	32	3	15	2	57	2	39	2	20	2	2	1	43	1	25	1	6
Alphacca ..	4	45	4	27	4	9	3	51	3	34	3	16	2	58	2	40	2	22	2	3	1	44	1	25
α Serpens ...	4	54	4	36	4	18	4	0	3	42	3	24	3	7	2	48	2	30	2	12	1	53	1	34
ANTARES ..	5	37	5	19	5	1	4	43	4	25	4	7	3	49	3	30	3	13	2	54	2	36	2	17
Ras Algethi	6	25	6	7	5	49	5	31	5	13	4	55	4	37	4	18	4	0	3	42	3	23	3	5
Ras Alhague	6	45	6	27	6	9	5	51	5	33	5	15	4	57	4	39	4	20	4	2	3	43	3	24
Rastaban ..	7	11	6	53	6	35	6	17	5	59	5	41	5	23	5	4	4	46	4	27	4	9	3	50
Vega	7	49	7	31	7	13	6	55	6	37	6	19	6	1	5	43	5	25	5	6	4	47	4	28
α AQUILÆ ...	9	0	8	42	8	24	8	6	7	48	7	30	7	12	6	54	6	36	6	17	5	58	5	39
α Pavo	9	30	9	11	8	53	8	36	8	18	8	0	7	42	7	23	7	5	6	46	6	28	6	9
Deneb	9	54	9	35	9	17	8	59	8	42	8	24	8	5	7	47	7	29	7	10	6	52	6	33
Alderaimin.	10	32	10	13	9	56	9	38	9	21	9	3	8	44	8	26	8	8	7	49	7	31	7	12
α Aquarius..	11	14	10	56	10	38	10	20	10	3	9	45	9	27	9	9	8	50	8	32	8	13	7	54
α Grux	11	14	10	56	10	38	10	20	10	3	9	45	9	27	9	9	8	50	8	32	8	13	7	54
FOMALHAUT	12	5	11	47	11	29	11	11	10	53	10	35	10	17	10	0	9	41	9	23	9	4	8	45
Scheat	12	12	11	54	11	36	11	18	11	0	10	42	10	24	10	6	9	50	9	30	9	11	8	52
MARCAB ...	12	13	11	55	11	37	11	19	11	1	10	43	10	25	10	7	9	50	9	31	9	12	8	53
Alpheratz ..	13	16	12	58	12	40	12	22	12	4	11	46	11	28	11	10	10	52	10	33	10	14	9	55

TABLE XVI.

For finding the APPARENT TIME of the PRINCIPAL STAR'S passing the MERIDIAN throughout the YEAR.

	November.										December.									
	1		6		11		16		21		26		1		6		11		16		21		26	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
Algenib ...	9	37	9	17	8	57	8	38	8	17	7	56	7	34	7	12	6	50	6	28	6	6	5	44
Schedar ...	10	3	9	41	9	23	9	3	8	42	8	22	8	1	7	39	7	17	6	55	6	33	6	10
Polar Star .	10	30	10	10	9	50	9	30	9	9	8	48	8	27	8	5	7	44	7	21	6	59	6	37
Mirach....	10	33	10	13	9	53	9	32	9	11	8	50	8	30	8	8	7	46	7	24	7	2	6	40
Achernar ..	11	4	10	44	10	24	10	4	9	43	9	22	9	0	8	38	8	18	7	55	7	33	7	11
α ARIETIS...	11	30	11	10	10	50	10	30	10	9	9	48	9	26	9	5	8	43	8	20	7	59	7	37
Menkar ...	12	26	12	6	11	46	11	26	11	5	10	44	10	22	10	0	9	38	9	16	8	54	8	32
Algol	12	29	12	10	11	50	11	29	11	8	10	47	10	26	10	4	9	42	9	20	8	58	8	35
α Perseus...	12	44	12	25	12	5	11	44	11	23	11	2	10	41	10	19	9	57	9	35	9	13	8	51
ALDEBARAN	14	0	13	39	13	19	12	58	12	37	12	16	11	55	11	33	11	11	10	49	10	27	10	5
Capella....	14	36	14	17	13	57	13	36	13	15	12	54	12	33	12	11	11	49	11	27	11	5	10	42
Rigel	14	39	14	19	13	59	13	39	13	18	12	57	12	35	12	13	11	51	11	29	11	7	10	45
β Taurus....	14	48	14	28	14	8	13	48	13	27	13	6	12	44	12	22	12	0	11	38	11	16	10	54
Bellatrix ..	14	48	14	29	14	9	13	48	13	27	13	6	12	45	12	23	12	1	11	39	11	17	10	54
ϑ Orion.....	14	56	14	36	14	16	13	55	13	35	13	13	12	52	12	30	12	8	11	46	11	24	11	2
ι Orion.....	15	0	14	40	14	20	14	0	13	39	13	18	12	56	12	35	12	13	11	50	11	28	11	6
α Columba ..	15	6	14	46	14	26	14	6	13	45	13	24	13	2	12	41	12	19	11	57	11	34	11	12
Betelguese .	15	18	14	58	14	39	14	18	13	57	13	36	13	15	12	53	12	31	12	9	11	47	11	24
Canopus ...	15	52	15	33	15	12	14	53	14	31	14	11	13	49	13	27	13	4	12	44	12	21	11	59
Sirius.....	16	9	15	49	15	29	15	9	14	48	14	27	14	6	13	45	13	22	13	1	12	38	12	16
Castor	16	55	16	35	16	15	15	55	15	34	15	13	14	51	14	30	14	8	13	46	13	24	13	2
Procyon ...	17	2	16	42	16	22	16	2	15	41	15	20	14	58	14	36	14	14	13	52	13	30	13	9
POLLUX ...	17	6	16	46	16	26	16	6	15	45	15	24	15	2	14	41	14	19	13	57	13	34	13	13
ξ Argo Navis	17	29	17	9	16	49	16	29	16	8	15	47	15	25	15	4	14	42	14	20	13	57	13	35
γ Argo Navis	17	36	17	16	16	56	16	37	16	15	15	54	15	32	15	10	14	49	14	26	14	4	13	42
ϑ Argo Navis	18	12	17	52	17	32	17	11	16	51	16	29	16	8	15	46	15	24	15	2	14	40	14	18
β Argo Navis	18	43	18	23	18	3	17	43	17	22	17	1	16	39	16	18	15	56	15	34	15	11	14	49
Alphard ...	18	51	18	31	18	11	17	50	17	30	17	8	16	47	16	25	16	3	15	41	15	19	14	57
REGULUS ..	19	31	19	11	18	51	18	30	18	10	17	48	17	27	17	5	16	43	16	21	15	59	15	37
β Ursa Major	20	23	20	3	19	43	19	23	19	2	18	41	18	19	17	57	17	35	17	13	16	51	16	29
Dubhe	20	24	20	5	19	45	19	24	19	3	18	42	18	21	17	59	17	37	17	15	16	53	16	31
Deneb.....	21	12	20	52	20	32	20	11	19	51	19	30	19	8	18	46	18	24	18	2	17	40	17	18
γ Ursa Major	21	16	20	56	20	36	20	16	19	55	19	34	19	13	18	51	18	29	18	7	17	45	17	22
α Crux	21	49	21	28	21	8	20	48	20	26	20	6	19	45	19	22	19	1	18	38	18	17	17	55
γ Crux	21	53	21	34	21	12	20	53	20	31	20	10	19	49	19	27	19	6	18	43	18	21	17	59
SPICA.....	22	47	22	27	22	7	21	46	21	26	21	4	20	43	20	21	20	0	19	37	19	15	18	54
Benetnach .	23	12	22	52	22	32	22	11	21	50	21	29	21	8	20	46	20	24	20	2	19	40	19	17
β Centaur...	23	22	23	2	22	42	22	22	22	1	21	40	21	18	20	57	20	35	20	13	19	50	19	28
α Draco.....	23	30	23	11	22	51	22	30	22	9	21	48	21	27	21	5	20	43	20	21	19	59	19	37
Arcturus ..	23	38	23	19	22	59	22	38	22	17	21	56	21	35	21	13	20	51	20	29	20	7	19	44
Seginus ...	23	56	23	36	23	16	22	55	22	35	22	13	21	52	21	30	21	8	20	46	20	24	20	2
α Centaur...	0	3	23	39	23	19	22	59	22	38	22	17	21	55	21	33	21	12	20	49	20	27	20	5
Zubenesch .	0	16	23	54	23	32	23	11	22	51	22	29	22	8	21	46	21	24	21	2	20	40	20	18
Zubenelg ..	0	42	0	23	0	2	23	38	23	17	22	56	22	35	22	13	21	51	21	29	21	7	20	44
Alphacca ..	1	2	0	42	0	22	23	58	23	37	23	16	22	54	22	33	22	11	21	48	21	26	21	4
α Serpens ..	1	10	0	51	0	31	0	10	23	45	23	24	23	3	22	41	22	19	21	57	21	35	21	12
ANTARES ..	1	53	1	34	1	13	0	53	0	32	0	11	23	46	23	24	23	2	22	40	22	18	21	55
Ras Algethi	2	41	2	22	2	2	1	41	1	20	0	59	0	38	0	16	23	50	23	28	23	6	22	43
Ras Alhague	3	2	2	42	2	22	2	1	1	40	1	19	0	58	0	36	0	14	23	48	23	26	23	4
Rastaban ..	3	26	3	8	2	48	2	27	2	6	1	45	1	24	1	2	0	40	0	18	23	52	23	29
Vega	4	5	3	45	3	25	3	5	2	45	2	23	2	2	1	40	1	18	0	56	0	34	0	12
α AQUILÆ ...	5	16	4	56	4	36	3	55	3	34	3	12	2	51	2	30	2	7	1	45	1	23	1	23
α Pavo	5	45	5	26	5	5	4	45	4	24	4	3	3	42	3	20	2	58	2	37	2	15	1	52
Deneb.....	6	9	5	49	5	29	5	9	4	48	4	27	4	5	3	44	3	22	3	0	2	39	2	16
Alderaimin.	6	48	6	28	6	8	5	48	5	27	5	6	4	44	4	23	4	1	3	39	3	16	2	54
α Aquarius..	7	30	7	11	6	51	6	30	6	9	5	48	5	27	5	5	4	43	4	21	3	59	3	37
α Grux	7	31	7	11	6	51	6	30	6	10	5	48	5	27	5	5	4	43	4	21	3	59	3	37
FOMALHAUT	8	22	8	2	7	42	7	21	7	0	6	39	6	18	5	56	5	34	5	12	4	50	4	28
Scheat	8	29	8	9	7	49	7	29	7	8	6	47	6	25	6	3	5	42	5	19	4	57	4	35
MARCAB...	8	30	8	10	7	50	7	29	7	9	6	47	6	26	6	4	5	42	5	20	4	58	4	36
Alpheratz..	9	32	9	12	8	53	8	33	8	12	7	51	7	29	7	8	6	46	6	24	6	0	5	39

TABLE XVII.

To find the LATITUDE by an Altitude of the POLAR STAR.

R. A. Merid.	Corr. for 1860.	Corr. for 1870.	R. A. Merid.	Corr. for 1860.	Corr. for 1870.	R. A. Merid.	Corr. for 1860.	Corr. for 1870.	R. A. Merid.	Corr for 1860.	Corr. for 1870.
h. m.	° ′	° ′	h. m.	° ′	° ′	h. m.	° ′	° ′	h. m.	° ′	h. m.
0 0	−1 23	−1 19	6 45	−0 9	−0 9	12 0	+1 23	+1 19	18 45	+0 9	+0 9
0 20	−1 25	−1 21	6 50	−0 7	−0 7	12 20	+1 25	+1 21	18 50	+0 7	+0 7
0 40	−1 26	−1 22	6 55	−0 5	−0 5	12 40	+1 26	+1 22	18 55	+0 5	+0 5
1 0	−1 26	−1 23	7 0	−0 3	−0 3	13 0	+1 26	+1 23	19 0	+0 3	+0 3
1 20	−1 26	−1 23	7 5	0 0	0 0	13 20	+1 26	+1 23	19 5	0 0	0 0
1 40	−1 25	−1 22	7 10	+0 1	+0 1	13 40	+1 25	+1 22	19 10	−0 1	−0 1
2 0	−1 24	−1 21	7 15	+0 3	+0 1	14 0	+1 24	+1 21	19 15	−0 3	−0 1
2 10	−1 23	−1 20	7 20	+0 5	+0 3	14 10	+1 23	+1 20	19 20	−0 5	−0 3
2 20	−1 21	−1 19	7 25	+0 7	+0 5	14 20	+1 21	+1 19	19 25	−0 7	−0 5
2 30	−1 20	−1 18	7 30	+0 9	+0 7	14 30	+1 20	+1 18	19 30	−0 9	−0 7
2 40	−1 19	−1 17	7 35	+0 11	+0 9	14 40	+1 19	+1 17	19 35	−0 11	−0 9
2 50	−1 18	−1 16	7 40	+0 13	+0 11	14 50	+1 18	+1 16	19 40	−0 13	−0 11
3 0	−1 16	−1 14	7 45	+0 15	+0 12	15 0	+1 16	+1 14	19 45	−0 15	−0 12
3 10	−1 14	−1 12	7 50	+0 17	+0 14	15 10	+1 14	+1 12	19 50	−0 17	−0 14
3 20	−1 12	−1 10	7 55	+0 18	+0 16	15 20	+1 12	+1 10	19 55	−0 18	−0 16
3 30	−1 10	−1 8	8 0	+0 19	+0 18	15 30	+1 10	+1 8	20 0	−0 19	−0 18
3 40	−1 7	−1 6	8 5	+0 21	+0 19	15 40	+1 7	+1 6	20 5	−0 21	−0 19
3 50	−1 5	−1 4	8 10	+0 23	+0 21	15 50	+1 5	+1 4	20 10	−0 23	−0 21
4 0	−1 2	−1 1	8 25	+0 25	+0 23	16 0	+1 2	+1 1	20 15	−0 25	−0 23
4 10	−1 1	−0 59	8 20	+0 27	+0 25	16 10	+1 1	+0 59	20 20	−0 27	−0 25
4 20	−0 58	−0 56	8 25	+0 28	+0 26	16 20	+0 58	+0 56	20 25	−0 28	−0 26
4 30	−0 55	−0 54	8 30	+0 29	+0 28	16 30	+0 55	+0 54	20 30	−0 29	−0 28
4 40	−0 51	−0 51	8 35	+0 31	+0 30	16 40	+0 51	+0 51	20 35	−0 31	−0 30
4 50	−0 49	−0 48	8 40	+0 34	+0 32	16 50	+0 49	+0 48	20 40	−0 34	−0 32
4 55	−0 47	−0 46	8 45	+0 36	+0 33	16 55	+0 47	+0 46	20 45	−0 36	−0 33
5 0	−0 45	−0 45	8 50	+0 38	+0 35	17 0	+0 45	+0 45	20 50	−0 38	−0 35
5 5	−0 44	−0 43	8 55	+0 39	+0 36	17 5	+0 44	+0 43	20 55	−0 39	−0 36
5 10	−0 42	−0 42	9 0	+0 42	+0 38	17 10	+0 42	+0 42	21 0	−0 42	−0 38
5 20	−0 38	−0 38	9 10	+0 45	+0 41	17 20	+0 38	+0 38	21 10	−0 45	−0 41
5 25	−0 37	−0 37	9 20	+0 48	+0 44	17 25	+0 37	+0 37	21 20	−0 48	−0 44
5 30	−0 36	−0 35	9 30	+0 51	+0 47	17 30	+0 36	+0 35	21 30	−0 51	−0 47
5 35	−0 34	−0 34	9 40	+0 53	+0 50	17 35	+0 34	+0 34	21 40	−0 53	−0 50
5 40	−0 32	−0 32	9 50	+0 56	+0 53	17 40	+0 33	+0 32	21 50	−0 56	−0 53
5 45	−0 31	−0 30	10 0	+0 59	+0 56	17 45	+0 31	+0 30	22 0	−0 59	−0 56
5 50	−0 29	−0 28	10 10	+1 2	+0 58	17 50	+0 29	+0 28	22 10	−1 2	−0 58
5 55	−0 27	−0 27	10 0	+1 4	+1 1	17 55	+0 27	+0 27	22 20	−1 4	−1 1
6 0	−0 25	−0 25	10 20	+1 7	+1 3	18 0	+0 25	+0 25	22 30	−1 7	−1 3
6 5	−0 23	−0 23	10 30	+1 9	+1 6	18 5	+0 23	+0 23	22 40	−1 9	−1 6
6 10	−0 22	−0 22	10 40	+1 10	+1 8	18 10	+0 22	+0 22	22 50	−1 10	−1 8
6 15	−0 20	−0 20	10 50	+1 12	+1 10	18 15	+0 20	+0 20	23 0	−1 12	−1 10
6 20	−0 18	−0 18	10 10	+1 15	+1 12	18 20	+0 18	+0 18	23 10	−1 15	−1 12
6 25	−0 16	−0 16	10 20	+1 17	+1 14	18 25	+0 16	+0 16	23 20	−1 17	−1 14
6 30	−0 15	−0 15	10 30	+1 19	+1 15	18 30	+0 15	+0 15	23 20	−1 19	−1 15
6 35	−0 13	−0 13	10 40	+1 20	+1 17	18 35	+0 13	+0 13	23 40	−1 20	−1 17
6 40	−0 11	−0 11	10 50	+1 22	+1 18	18 40	+0 11	+0 11	23 50	−1 22	−1 18

TABLE XVII*.

Corrections of the Latitude deduced from the above Table—*Additive.*

R. A. Merid.	APPROXIMATE LATITUDE.													R. A. Merid.
	0°	10°	20°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	
h. m.	′	′	′	′	′	′	′	′	′	′	′	′	′	′	h. m.
0 0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.6	2 0
1 0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1 0
2 0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.6	24 0
4 0	0.0	0.1	0.2	0.4	0.5	0.6	0.7	0.9	1.1	1.3	1.6	2.0	2.8	4.4	22 0
5 0	0.0	0.2	0.4	0.6	0.7	0.9	1.1	1.3	1.6	1.9	2.2	2 9	3 9	6.0	21 0
6 0	0.0	0.2	0.5	0.7	0.9	1.1	1.3	1.5	1.9	2.3	2.9	3.6	4.8	7.4	20 0
7 0	0.0	0.2	0.5	0.8	0.0	1.2	1.4	1.7	2.1	2.5	3.1	3.9	5.2	8.0	19 0
8 0	0.0	0.2	0.5	0.7	0.9	1.1	1.3	1.3	1.9	2.3	2.9	3.6	4.8	7.4	18 0
9 0	0.0	0.2	0.4	0 6	0.7	0.9	1.1	1.1	1.6	1.9	2.2	2.9	3.9	6.0	17 0
11 0	0.0	0.0	0.1	0.2	0.2	0.3	0.3	0 3	0.5	0.6	0.7	0.9	1.3	1.9	15 0
13 0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0 0	0.0	0.0	0.0	0.0	13 0

TABLE XVIII.

SUN'S MEAN RIGHT ASCENSION.

Days.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Days.
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	
1	18 46	20 58	22 48	0 42	2 33	4 35	6 40	8 45	10 41	12 29	14 25	16 29	1
2	18 50	21 02	22 52	0 45	2 37	4 40	6 44	8 49	10 44	12 32	14 29	16 33	2
3	18 54	21 06	22 56	0 49	2 40	4 44	6 48	8 52	10 48	12 36	14 33	16 37	3
4	18 59	21 10	22 59	0 53	2 44	4 48	6 52	8 56	10 52	12 40	14 37	16 42	4
5	19 03	21 14	23 03	0 56	2 48	4 52	6 56	9 00	10 55	12 43	14 41	16 46	5
6	19 08	21 18	23 07	1 00	2 52	4 56	7 00	9 04	10 59	12 47	14 45	16 51	6
7	19 12	21 22	23 10	1 04	2 56	5 00	7 04	9 08	11 02	12 51	14 49	16 55	7
8	19 16	21 26	23 14	1 07	3 00	5 04	7 09	9 12	11 06	12 54	14 53	16 59	8
9	19 21	21 30	23 18	1 11	3 04	5 08	7 13	9 15	11 10	12 58	14 57	17 04	9
10	19 25	21 34	23 21	1 15	3 08	5 13	7 17	9 19	11 13	13 02	15 01	17 08	10
11	19 29	21 38	23 25	1 18	3 11	5 17	7 21	9 23	11 17	13 05	15 05	17 13	11
12	19 34	21 42	23 29	1 22	3 15	5 21	7 25	9 27	11 20	13 09	15 09	17 17	12
13	19 38	21 46	23 33	1 26	3 19	5 25	7 29	9 31	11 24	13 13	15 13	17 21	13
14	19 42	21 50	23 36	1 29	3 23	5 29	7 33	9 34	11 28	13 16	15 17	17 26	14
15	19 47	21 54	23 40	1 33	3 27	5 33	7 37	9 38	11 31	13 20	15 21	17 30	15
16	19 51	21 58	23 43	1 37	3 31	5 37	7 41	9 42	11 35	13 24	15 25	17 35	16
17	19 55	22 02	23 47	1 40	3 35	5 42	7 45	9 46	11 38	13 28	15 30	17 39	17
18	20 00	22 05	23 51	1 44	3 39	5 46	7 49	9 49	11 42	13 31	15 34	17 43	18
19	20 04	22 09	23 54	1 48	3 43	5 50	7 53	9 53	11 46	13 35	15 38	17 48	19
20	20 08	22 13	23 58	1 51	3 47	5 54	7 57	9 57	11 49	13 39	15 42	17 52	20
21	20 12	22 17	0 02	1 55	3 51	5 58	8 01	10 00	11 53	13 43	15 46	17 57	21
22	20 17	22 21	0 05	1 59	3 55	6 02	8 05	10 04	11 56	13 46	15 50	18 01	22
23	20 21	22 25	0 09	2 03	3 59	6 07	8 09	10 08	12 00	13 50	15 55	18 06	23
24	20 25	22 28	0 13	2 06	4 03	6 11	8 13	10 12	12 04	13 54	15 59	18 10	24
25	20 29	22 32	0 16	2 10	4 07	6 15	8 17	10 15	12 07	13 58	16 03	18 15	25
26	20 33	22 36	0 20	2 14	4 11	6 19	8 21	10 19	12 11	14 02	16 07	18 19	26
27	20 37	22 40	0 23	2 18	4 15	6 23	8 25	10 23	12 14	14 06	16 12	18 23	27
28	20 42	22 43	0 27	2 21	4 19	6 27	8 29	10 26	12 18	14 09	16 16	18 28	28
29	20 46	22 46	0 31	2 25	4 23	6 31	8 33	10 30	12 22	14 13	16 20	18 32	29
30	20 50		0 34	2 29	4 27	6 36	8 37	10 33	12 25	14 17	16 25	18 37	30
31	20 54		0 38		4 31		8 41	10 37		14 21		18 41	31

LATITUDES AND LONGITUDES

OF THE

PRINCIPAL PORTS, HARBOURS, HEADLANDS, ETC., OF EUROPE AND THE ATLANTIC.

Longitudes are East and West from the Meridian of Greenwich.

I. COAST OF GREAT BRITAIN.

(1) Places.	Lat. N.			Long.		
	°	′	″	°	′	″
GREENWICH Obs.	51	28	38	0	0	0
				East		
Sheerness Flag Staff	51	26	45	0	44	26
N. Foreland Light	51	22	28	1	26	48
Deal Castle	51	13	5	1	23	59
SOUTH COAST OF ENGLAND.						
S. Foreland Up. Light	51	8	23	1	22	22
Dover Castle	51	7	47	1	19	7
Dungeness Light	50	54	47	0	58	18
Beachy Head Light	50	44	15	0	12	58
				West.		
Shoreham Church	50	50	0	0	16	19
Chichester Church	50	50	11	0	46	36
Portsmouth R.N. Coll.	50	48	4	1	5	59
Bembridge Point	50	41	15	1	4	0
St. Catherine's Light.	50	34	30	1	17	47
Needles Light	50	39	40	1	35	27
Poole Church	50	42	51	1	58	55
St. Alban's Head	50	34	35	2	3	0
Portland Up. Light	50	31	18	2	27	18
Lyme Regis	50	43	11	2	56	0
Berry Head, Tor Bay.	50	24	0	3	29	0
Dartmouth, St. Petrox Castle	50	20	0	3	33	0
Start Point Light.	50	13	18	3	38	28
Eddystone Light	50	10	49	4	15	53
Mewstone	50	18	10	4	6	0
Plymouth, —Breakwater Dial	50	19	59	4	8	52
Dodman's Point	50	13	0	4	48	0
Falmouth, —St. Anthony's Hd. Lt.	50	8	0	5	1	0
Lizard Upper Light	49	57	34	5	12	4
St. Michael's Mount	50	7	0	5	28	30
Rundlestone	50	1	10	5	40	2
Wolf Rock Light	49	56	43	5	48	27
Longship's Light	50	3	58	5	44	45
Scilly Islands, —St. Agnes' Light	49	53	33	6	20	38
—Bishop's Rock Lt.	49	52	23	6	26	40
Seven Stones Lt.-ves.	50	3	37	6	4	37

WEST COAST OF ENGLAND.

(2) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Cape Cornwall	50	7	45	5	42	30
St. Ives, Godrevy Lt.	50	14	0	5	24	0
Trevose Head Light.	50	32	55	5	2	3
Padstow	50	32	30	4	56	0
Tintagel Head	50	39	48	4	45	30
Hartland Point	51	1	24	4	31	30
Morte Point	51	11	20	4	13	40
Lundy I. Light	51	10	5	4	40	20
Foreland Point	51	14	45	3	47	0
Flatholm Light	51	22	33	3	7	0
Bristol Cathedral	51	26	48	2	35	30
Nash Point High Lt.	51	24	0	3	33	0
Mumbles Pt. and Lt.	51	34	0	3	58	12
Worms Head	51	33	56	4	20	0
Caldy Island Light	51	37	40	4	41	0
St. Ann's Light	51	40	59	5	10	30
Smalls Light	51	43	18	5	40	5
Grasholm	51	43	55	5	28	45
South Bishop Light	51	51	0	5	25	0
Strumble Head	52	1	40	5	5	0
Cardigan Bay Lt.-ves.	52	24	0	5	0	0
Aberystwith	52	25	0	4	5	0
Bardsey I. Light	52	45	0	4	48	0
South Stack Light	53	18	0	4	42	0
Skerries Light	53	25	18	4	36	24
Point Lynus Light	53	25	0	4	17	16
Great Orme Head	53	20	35	3	52	0
Point of Air Light	53	21	28	3	19	25
Liverpool, St. Paul's	53	24	40	2	59	30
Formby Point	53	33	40	3	6	0
Walney Point Light.	54	2	56	3	10	32
St. Bees Head Light.	54	30	50	3	38	0

ISLE OF MAN.

Air Point Light	54	24	56	4	22	0
Douglas	54	9	30	4	28	0
Castletown.	54	5	0	4	39	0
The Calf Light	54	3	0	4	50	0
Peel Light.	54	13	0	4	42	0

TABLE XIX.

LATITUDES AND LONGITUDES.

(3) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
WEST AND NORTH COAST OF SCOTLAND.						
Ross I. Light	54	46	0	4	5	0
Mull of Galloway Lt.	54	38	9	4	51	20
Corsewall Point Light	55	0	29	5	9	28
Ailsa Craig	55	15	14	5	7	0
Cumbrae I. Light.	55	43	16	4	58	0
Pladda Light	55	26	0	5	7	9
Mull of Cantire Light	55	18	39	5	48	0
Oversay I. Light	55	40	20	6	30	46
Skerryvore Light.	56	19	22	7	6	32
Coll Island, N. end	56	41	40	6	28	0
Ardnamurchan Pt. Lt.	56	43	38	6	13	29
Rum Island, W. point	57	0	30	6	28	0
Dunvegan Head	57	30	40	6	43	0
Skeir Graitich Beacon	57	47	20	6	28	0
Ru Rea	57	51	30	5	48	10
Ru Stoer Light	58	14	10	5	23	0
Cape Wrath Light	58	37	30	4	59	41
Nun Rock	58	52	30	4	57	0
Rona Island	59	7	0	5	49	0
Barra, or Sulisker.	59	5	30	6	9	0
Stack Skerry	59	1	20	4	30	0
Sule Skerry	59	4	40	4	24	0
Dunnet Head Light	58	40	16	3	22	20
Duncansby Head	58	39	0	3	1	30
HEBRIDES, OR LEWIS ISLANDS.						
Barra Head Light	56	47	8	7	39	9
Uist, Ushinish Light	57	17	55	7	11	31
Glass I. Light	57	51	25	6	38	28
Butt of Lewis Light.	58	30	40	6	16	0
Gallon Head	58	14	30	7	2	0
Flannan Isles, E. Mor.	58	17	0	7	35	30
St. Kilda	57	49	0	8	34	42
Shillay Light	57	38	0	7	41	0
Rockall	57	36	0	13	41	0
ORKNEY ISLANDS.						
Pentland Skerries, Lts.	58	41	22	2	55	25
Copinsha	58	54	0	2	40	0
Auskerry Light	59	2	0	2	34	0
Start Point Light.	59	16	30	2	22	25
North Ronaldsha Lt.	59	23	15	2	23	38
Papa Westra Isle, —Mullhead	59	23	0	2	53	0
Noup Head	59	20	0	3	4	0
Brough of Birsa	59	8	15	3	20	0
Hoy Island, Roray Hd.	58	52	30	3	26	0
Fair Island, Ward Hill	59	2	24	1	7	46
SHETLAND ISLANDS.						
Sumbro Head Light	59	51	15	1	17	0
Hangcliff or Noss Hd.	60	8	20	1	0	20
Lerwick Fort	60	9	30	1	8	40
Out Skerries Light	60	25	30	0	44	0
N. Unst, Burra Light	60	51	20	0	53	3
Esha Ness Skerry.	60	28	30	1	37	30
Ve Skerries.	60	22	30	1	49	0
Foul Island, N. Pt.	60	9	0	2	6	0

(4) Places.	Lat. N.			Lon. W.		
	°	′	″	°	′	″
FAROE ISLANDS.						
Monk Rock	61	20	0	6	41	0
Great Diamond	61	43	0	6	43	30
Stromoe, Thorshaven.	62	0	0	6	42	30
Fugloe	62	20	0	6	13	0
Mygenas I. W. end	62	7	0	7	32	30
EAST COAST OF SCOTLAND.						
Noss Head Light	58	28	38	3	3	5
Clyth Ness.	58	18	30	3	13	20
Ord of Caithness	58	10	15	3	31	0
Tarbet Ness Light	57	51	54	3	46	30
Inverness Jail.	57	28	40	4	13	30
Covesea Scars Light	57	43	15	3	20	20
Banff Light	57	40	0	2	31	30
Kinnaird Head Light.	57	41	51	2	0	6
Buchan Ness Light	57	28	15	1	46	11
Aberdeen, —Girdleness Light	57	8	15	2	3	2
Montrose Ness Light.	56	42	0	2	26	0
Arbroath Light	56	33	0	2	35	0
Buddon Ness Lights	56	28	0	2	45	0
Dundee	56	28	0	2	57	30
Bell Rock Light	56	26	3	2	23	6
EDINBURGH, Obsy.	55	57	25	3	10	45
Inch Keith Light	56	2	0	3	8	0
North Berwick, Law	56	3	8	2	43	10
May I. Light	56	11	9	2	33	22
St. Abb's Head Light.	55	55	0	2	8	0
EAST COAST OF ENGLAND.						
Berwick Light	55	46	12	1	59	0
Holy Island Castle	55	40	20	1	47	0
Farn I., Longstone Lt.	55	39	0	1	37	0
Coquet Island Light	55	20	11	1	32	0
Tynemouth, Souter Pt. Light	54	58	10	1	21	30
Sunderland Light.	54	55	12	1	20	0
Hartlepool, Heugh Lt.	54	41	49	1	10	20
River Tees, entrance	54	39	0	1	7	0
Whitby, Ling Hill Lights	54	28	40	0	34	10
Scarborough Light	54	17	0	0	23	0
Flambro' Head Light.	54	7	0	0	5	0
				East.		
Spurn Lights	53	34	44	0	7	10
Hunstanton Light	52	56	54	0	29	50
Outer Dowsing Light.	53	28	15	1	2	40
Dudgeon Light	53	19	0	0	56	0
Leman Light	53	8	40	2	1	0
Smith's Knowl, S. Pt.	52	48	0	2	14	0
Cromer Light	52	55	20	1	19	0
Hasborough Lights	52	49	0	1	32	0
Winterton Light	52	43	0	1	41	30
Yarmouth Church	52	36	40	1	43	22
Lowestoft High Light	52	29	14	1	45	24
Orfordness Light	52	5	0	1	34	30
Landguard Fort	51	56	15	1	19	0
Naze Tower	51	51	51	1	17	7
Galloper Light Vessel	51	44	0	1	56	0

LATITUDES AND LONGITUDES.

II. COAST OF IRELAND.

WEST COAST OF IRELAND.

(5) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Cape Clear, Old Light. Tower	51	26	0	9	29	20
Fastnet Rock Light	51	23	18	9	36	25
Mizen Head	51	27	0	9	49	30
Bantry Bay —Sheep's Head	51	32	40	9	51	0
Calf Light	51	34	10	10	14	50
Great Hog Island	51	44	0	10	15	0
Bolus Head	51	47	0	10	21	0
Skellig Light	51	46	14	10	32	45
Dingle Bay, —Bray Head	51	52	40	10	26	0
—Valentia Harb Lt.	51	56	0	10	19	16
—Dunmore Head.	52	6	40	10	28	30
Tearaght I. Light.	52	4	30	10	40	0
Smerwick Har. ent.	52	13	0	10	23	30
Brandon Point	52	17	30	10	9	30
River Shannon, —Kerry Head	52	25	20	9	56	30
—Loop Head Light	52	33	38	9	55	54
—Limerick	52	39	40	8	37	30
Hags Head.	52	57	0	9	28	0
Galway Bay, —Black Head	53	9	0	9	16	0
—Galway	53	16	30	9	3	0
Arran Is. Inisheer Lt.	53	2	40	9	31	30
—Eeragh Light	53	8	55	9	51	30
Skird Rocks	53	15	25	10	0	0
Slyne Head Light	53	23	58	10	14	1
Inishark W. end	53	36	20	10	18	0
Clare I. Light.	53	49	30	9	59	30
Achill Head	53	58	30	10	15	30
Black Rock Light	54	4	10	10	19	20
Eagle I. Light	54	17	0	10	5	31
Broad Haven, —Erris Head	54	18	25	9	59	50
Stag Rocks	54	22	0	9	47	30
Downpatrick Head	54	19	30	9	21	0
Killala	54	12	40	9	13	0
Sligo, Black Rock Lt.	54	18	20	8	37	0
Inish Murray	54	26	0	8	39	30
Donegal	54	39	25	8	7	0
St. John's Pt. Light	54	34	8	8	27	33
Rathlin o'Birne Light.	54	39	47	8	49	52
Dawrus Head	54	49	40	8	33	40
Aran I. Light	55	0	50	8	33	40

NORTH COAST OF IRELAND.

Bloody Foreland	55	9	30	8	17	0
Tory Island Light	55	16	30	8	15	0
Horn Head	55	13	40	7	59	0
Point Fanad Light	55	16	33	7	37	53
Malin Head	55	22	30	7	24	0
Irelands North Point.	55	23	0	7	22	20
Innistrahull Light	55	25	55	7	13	37
Inishowen Head Lt.	55	13	38	6	55	38
Londonderry	54	59	28	7	19	30

NORTH COAST OF IRELAND—*cont.*

(6) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Bengore Head, —Giant's Causeway	55	14	30	6	30	30
Rathlin I. Light	55	18	10	6	10	0
Fair Head	55	13	35	6	9	0
Tor Head	55	11	40	6	3	40

EAST COAST OF IRELAND.

Maiden Rks. W. Light	54	55	47	5	44	18
Black Head	54	46	0	5	41	20
Belfast	54	36	20	5	56	20
Copeland I. Light	54	41	44	5	32	0
South Rock Light	54	23	55	5	25	4
St. John's Pt. Light	54	13	10	5	40	0
Hawlboline Rock Lt.	54	1	0	6	5	0
Clogher Head	53	47	40	6	13	0
Drogheda Sand Hills, Lights	53	43	0	6	15	0
Rockabill Light	53	35	45	6	0	30
Lambay Island	53	29	30	6	1	0
Howth Baily Light	53	21	40	6	3	20
DUBLIN, Poolbeg Lt.	53	20	30	6	9	16
—Observatory	53	23	13	6	20	20
Wicklow Head Light.	52	57	50	6	0	5
Arklow Church	52	47	50	6	9	12
Cahore Point	52	33	45	6	11	30
Wexford Harb. ent.	52	20	0	6	18	30

SOUTH COAST OF IRELAND.

Carnsore Point	52	10	30	6	21	50
Tuskar Rock Light	52	12	9	6	12	21
Saltees Rocks, Coningbeg Light Vessel	52	2	25	6	40	0
Hook Pt. Light	52	7	25	6	55	53
Waterford	52	16	0	7	6	0
Brownstown Head	52	7	45	7	6	30
Dungarvan, Helvick Head	52	3	20	7	32	15
Mine Head Light	51	59	33	7	35	8
Youghal Light	51	56	34	7	50	34
Ballycottin Light	51	49	30	7	59	0
Roche Point Light	51	47	33	8	15	14
Cork	51	53	54	8	28	0
Kinsale Old Head Lt.	51	36	11	8	31	58
Seven Heads	51	34	15	8	43	0
Galley Head	51	31	50	8	57	30
Stags, off Toe Head	51	28	0	9	13	30
Baltimore	51	29	0	9	22	20

III. COAST OF NORWAY AND LAPLAND,

From Nova Zemlia to the Naze.

				East.		
Nova Zemlia, C. Desire	76	45	0	77	20	0
Cape Nassau	76	35	0	62	50	0
Kara Strait, W. ent.	70	20	0	57	37	0
Waigat I. N. Pt.	70	28	0	59	5	0
Petchora R. W. Pt. of entrance.	68	57	0	54	40	0
Kolguev I. N. Pt.	69	30	0	48	56	0

TABLE XIX.

LATITUDES AND LONGITUDES.

WHITE SEA.

(7) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
Cape Kaninose	68	39	10	43	32	34
Cape Konoushin	67	12	0	43	48	0
Morshovets Is. Light.	66	45	40	42	29	50
Cape Voronof or Good Fortune	66	31	0	42	19	40
Cape Katness	65	26	0	39	43	0
Archangel, Mudoska Light	64	54	47	40	17	0
—City	64	32	10	40	33	30
Jijginsk I. Light	65	12	17	36	51	30
Solovetski I. Light	65	7	0	35	37	30
Onega	63	53	36	38	8	30
Kandalax	67	8	0	32	26	0
Sosnovits or Cross Lt.	66	29	18	40	43	27
Orlofka Pt. Light	67	11	30	41	21	55
Pt. Gorodetski	67	43	0	40	57	0
Cape Swiatoi Nos Lt.	68	8	51	39	48	54

COAST OF NORWAY AND LAPLAND.

Kilduin Island, W end	69	21	0	33	50	0
Vardo	70	22	36	31	8	0
North Cape	71	10	15	25	50	45
Fruholm Light	71	5	45	23	59	25
Hammerfest, —Fugleness Pt. Light	70	40	15	23	40	0
Andenas Light	69	19	30	16	8	10
Rost Island	67	31	0	12	7	0
Vigten Isles, N.E. Pt. Outer I.	64	58	25	11	11	0
Villa Light	64	32	50	10	41	55
Titter Holen	63	40	0	8	19	0
Drontheim	63	25	50	10	23	42
Griboerne, middle	63	14	0	7	35	0
Christiansund Light	63	6	30	7	42	0
Quitholm Light	63	2	15	7	12	30
Rondo Light	62	24	36	5	35	10
Aspo I, N. end	61	13	0	4	44	0
Udver Is. anchorage.	61	2	30	4	30	30
Hellisoe Light	60	45	5	4	43	5
Bergen, Mole Light	60	24	0	5	18	20
Kors Fiord, Beacon	60	7	45	5	2	2
Selbo Fiord, Slottero Light	59	54	30	5	4	30
Bommel-oe, Ryvarden Light	59	31	35	5	13	35
Udsire Lights	59	18	20	4	52	40
Skudesnaes Light	59	8	25	5	18	0
Hviddings-oe Light	59	3	40	5	24	30
Tungeness Light	59	2	6	5	35	0
Stavanger	58	58	15	5	44	0
Little Feisten Light	58	49	30	5	30	55
Jedderen Reef Beacon	58	45	40	5	30	30
Siregrunden	58	14	45	6	21	0
Ekero Light	58	26	0	5	52	15
Lister Land, Gunnarshoug Light	58	6	30	6	34	10
Lindernæs or Naze Lt.	57	59	0	7	3	0

IV. THE SLEEVE, CATTEGAT AND SOUND.

(8) Places.	Lat. N.			Lon. E.		
	°	′	″	°	′	″
Mandel, Ryvingen Lt.	57	58	5	7	29	40
Christiansand	58	8	4	8	3	0
Oxo Light	58	4	25	8	3	35
Arendal, out. Torungen Light	58	24	5	8	47	45
Oster Risor, Stangholm Light	58	42	40	9	15	0
Jomfruland Light	58	52	10	9	36	15
Færder Light	59	2	0	10	32	5
Christiania New Obs.	59	54	42	10	43	15
N. Koster I. Light	58	54	12	11	0	36
Waderobod Light	58	32	42	11	2	18
Hallo Light	58	20	12	11	13	24
Maseskar Light	58	5	42	11	20	18
Paternosters, Hamnskar Light	57	53	48	11	28	6
Gothenburg	57	41	55	11	56	40
Winga Light	57	38	0	11	36	0
Nidingen Lights	57	18	12	11	54	24
Morup Tange Light	56	55	24	12	21	54
Kullen or Koll Light.	56	17	54	12	27	18
Helsingborg	56	2	42	12	41	36
Malmo	55	36	20	13	0	20
Falsterbo Light	55	23	0	12	49	18
Steffen's Head Light.	55	17	30	12	27	28
COPENHAGEN Obs.	55	40	53	12	34	45
Hveen I., S. W. Pt.	55	55	10	12	40	30
Elsinore, Kronborg Lt.	56	2	22	12	37	35
Nakke Head Lights	56	7	10	12	21	12
Hessel I. Light	56	11	50	11	42	50
Anholt I. Light	56	44	16	11	39	14
Great Middle Ground.	56	34	0	12	4	30
Little Middle Ground.	56	57	0	11	56	0
Kobber Grd. Lt.-Ves.	57	8	50	11	22	46
Trindelen Rock Light	57	25	50	11	16	0
Skagen or Scaw Light	57	44	9	10	37	56
Hirtsholmen Light	57	29	13	10	37	34
Aalborg, ent. Hals Light	56	59	35	10	18	30
Grenaa, Forness Lt.	56	26	36	10	57	39
Aarhuus	56	9	35	10	13	0
Apenrade	55	2	35	9	25	10
Flensborg	54	46	55	9	26	10
Sleswig	54	31	0	9	33	57
Reefness Light	55	44	36	10	52	22
Sprogoe I. Light	55	19	51	10	58	25
Vordingborg	55	0	10	11	55	10
Langeland S. Pt. Lt.	54	44	23	10	42	12
Falster Gjedser Head Light	54	33	50	11	58	2
Moen I. Speil Cliff Lt.	54	56	50	12	32	45
Kiel Observatory	54	19	30	10	9	0
Femern, Marien Lt.	54	29	39	11	14	28
Lubeck	53	52	5	10	41	30
Wismar	53	53	30	11	27	42
Rostock	54	5	30	12	9	0
Dars Head Lights	54	28	56	12	31	0
Arcona Light	54	41	0	13	26	10

LATITUDES AND LONGITUDES.

V. THE BALTIC.

(9) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
Ystad	55	25	52	13	49	30
Sandhammar Hd. Lts.	55	23	0	14	11	30
Hano I. Light	56	0	30	14	51	0
Carlskrona Gt. Ch.	56	9	42	15	35	30
Utklipporna Rocks Lt.	55	57	12	15	42	6
Kalmar Church	56	39	30	16	22	0
Oscarshamn	57	16	0	16	28	0
Haradskar Light	58	8	48	16	59	42
Hafringe Beacon	58	36	0	17	19	0
Landsort Light	58	44	30	17	52	24
Stockholm Obsy.	59	20	31	18	3	30
Gronskar Light	59	16	48	19	1	54
Soderarm Light	59	45	22	19	24	48
Arcona Light	54	41	0	13	26	10
Griefswalde Light	54	14	45	13	55	27
Stettin	53	25	5	14	34	0
Colberg Bar Light	54	11	12	15	34	0
Jershoft Light	54	32	40	16	33	0
Rixhoft Light	54	50	0	18	20	40
Hela Light	54	36	6	18	49	12
Dantzig Observatory	54	21	20	18	41	10
Pillau Light	54	38	18	19	54	12
Brusterort Light	54	57	48	19	59	12
Memel Light	55	43	40	21	6	10
Libau Light	56	31	1	20	59	45
Steinort Cape	56	50	0	21	4	0
Windau Light	57	23	48	21	32	24
Lyserort Light	57	34	7	21	43	57
Domesness Lights	57	45	39	22	37	30
Runo I. Light	57	48	8	23	15	32
Riga Cathedral	56	57	0	24	6	30
Pernau	58	23	15	24	30	50

ISLANDS IN THE BALTIC.

Dagerort Light	58	55	2	22	13	10
Filsand Light	58	23	2	21	49	56
Oesel, Pamerort Pt.	58	38	30	22	33	30
—Swalferort Light	57	54	37	22	4	15
—Arensberg	58	15	5	22	30	0
Gottska Sando, —N. Pt. Light	58	23	12	19	12	54
Faro, Holm Hd. Lt.	57	57	24	19	22	36
Gottland, —Wisby	57	38	50	18	16	21
—Great Carlso	57	18	0	17	59	0
—Hoborg Light	56	55	18	18	11	6
Ostergarnsholm Lt.	57	26	24	18	59	48
Oland, N. Head Lt.	57	22	0	17	6	0
—South Head Light	56	11	48	16	24	0
Eartholms, Christian Oe Light	55	19	19	15	11	39
Bornholm, Hammeren Light	55	17	8	14	46	47
—Ronne Light	55	5	40	14	42	0
—Due Odde	54	59	0	15	5	0

VI. THE GULFS OF FINLAND AND BOTHNIA.

S. COAST OF THE GULF OF FINLAND.

(10) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
Dagerort Light	58	55	2	22	13	10
Odensholm Light	59	18	17	23	22	51
Packerort Light	59	23	20	24	3	24
Surep Head	59	27	55	24	24	5
Nargen I., N. Pt. Lt.	59	36	22	24	31	57
Revel, St. Olai Ch.	59	26	30	24	45	10
Kokskar Light	59	42	0	25	2	0
Ekholm Light	59	41	6	25	48	58
Stenskar Tower	59	49	0	26	23	0
Rodskar Light	59	58	8	26	41	5
Little Tyters, N.W. end	59	49	0	26	55	0
Great Tyters, S. end	59	50	5	27	13	0
Narva Light	59	28	4	28	3	31
Lavensari N. Pt. Bea.	60	2	30	27	50	30
Seskar Light	60	2	8	28	23	1
Dolgoinos	59	54	50	29	1	0
Tolbeacon Light	60	2	35	29	32	40
Cronstadt, St. Andrew Church	59	59	43	29	46	2
ST. PETERSBURGH Observatory	59	56	30	30	18	15

N. COAST OF THE GULF OF FINLAND.

Styrsodde Beacon	60	11	5	29	3	9
Wiburg	60	42	40	28	46	0
Nervo Light	60	14	43	27	58	36
Sommars Light	60	12	32	27	39	46
Aspo Beacon	60	17	20	27	13	0
Hogland N. High Lt.	60	5	44	26	58	24
—South Light	60	0	40	27	1	40
Lovisa Church	60	27	38	26	15	0
Orrenground Beacon	60	16	35	26	27	0
Glosholm	60	11	0	25	48	30
Soder Skar Light	60	6	40	25	25	51
Helsingfors	60	9	42	24	57	30
Ronskar Light	59	56	10	24	24	43
Jussari Beacon	59	49	43	23	34	0
Hango I. Light	59	46	0	22	58	8
Abo Observatory	60	27	0	22	17	30
Uto Light	59	46	30	21	22	0

GULF OF BOTHNIA.

Lagskar Light	59	50	50	19	55	5
Soderarm Light	59	45	22	19	24	48
Understen Light	60	16	36	18	55	36
Orskar Light	60	31	42	18	22	54
Gefle	60	40	18	17	9	0
Soderhamn	61	17	42	17	5	0
Broemo Light	62	13	6	17	45	30
Hernosand	62	37	54	17	57	0
Northskær Light	63	14	8	20	37	40
Umea	63	40	30	20	18	0
Holmo Gadd Light	63	35	48	20	46	36

LATITUDES AND LONGITUDES.

GULF OF BOTHNIA—*cont.*

(11) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
Binroklubb Light.	64	29	18	21	35	24
Maloe Light	65	31	42	23	36	30
Tornea	65	50	48	24	14	0
Uleaborg	65	1	0	25	29	0
Gamle Carleby	63	50	0	23	8	0
Wasa	63	4	18	21	42	0
Christinestad	62	16	12	21	23	0
Biorneborg	61	29	0	21	48	0
Enskar Light	60	43	10	21	1	0

VII. COASTS OF DENMARK, GERMANY, HOLLAND, AND BELGIUM, From the Scaw to Calais.

Skagen or Skaw Lt.	57	44	9	10	37	56
Hirtshals Light	57	35	0	9	56	38
Hantsholm Light.	57	6	50	8	36	10
Tyboren Chan. Ent.	56	42	42	8	14	28
Horn Point	55	34	0	8	5	0
Sylt Is., Rode Klif Lt.	54	56	50	8	20	36
Helgoland Light	54	10	50	7	53	5
Neuwerk Lights	53	55	2	8	29	44
Cuxhaven Lights	53	52	26	8	42	29
Hamburgh	53	32	51	9	58	30
Bremen Observatory	53	4	38	8	49	0
Wangeroog Light.	53	47	26	7	53	55
Borcum Light.	53	35	22	6	40	0
Emden	53	22	3	7	12	42
Ter Schelling Light	53	21	40	5	13	7
Harlingen	53	10	32	5	24	47
Entr. to Texel, —Kykduin Fort Lt.	52	57	5	4	43	30
Amsterdam	52	22	30	4	53	15
Leyden Observatory	52	9	30	4	29	30
The Hague	52	4	20	4	18	47
Hook of Holland	51	57	0	4	6	0
Rotterdam Cath.	51	55	18	4	29	30
Brielle Church	51	42	12	4	10	0
Goeree Ch. Light.	51	49	7	3	58	47
Schouwen Hoek Light	51	42	36	3	41	42
Bergen op Zoom, Ch.	51	29	42	4	17	30
Walcheren, —West Kapelle Light	51	31	46	3	26	52
Middleburg	51	30	6	3	37	0
Flushing Light	51	26	23	3	34	44
Antwerp Cathedral	51	13	16	4	24	10
Terneuse or Neuzen Light.	51	20	30	3	49	30
Fort Breskens.	51	24	10	3	32	30
Blankenberg Light	51	18	57	3	7	51
Ostende E. Light.	51	14	13	2	55	54
Nieuport In. Light	51	8	33	2	44	30
Dunkerque Light.	51	3	0	2	21	50
Gravelines Light	51	0	18	2	6	29
Calais Tower Light	50	57	36	1	51	15

VIII. COASTS OF FRANCE, SPAIN AND PORTUGAL, From Calais to Gibraltar.

NORTH COAST OF FRANCE.

(12) Places.	Lat. N.			Lon. E.		
	°	′	″	°	′	″
Calais Tower Light	50	57	36	1	51	15
C. Grisnez Light	50	52	10	1	34	56
C. d'Alprech	50	41	57	1	33	41
Pt. de l'Ornel	50	33	38	1	34	36
Pt. du Haut Banc Lt.	50	24	0	1	33	31
Cayeux Light	50	11	42	1	30	41
Treport, W. Mole	50	3	53	1	22	9
Dieppe, W. Mole	49	56	2	1	4	57
Pt. d'Ailly Light	49	55	7	0	57	29
St. Valery en Caux Light	49	52	25	0	42	30
Fecamp Light.	49	45	57	0	21	47
C. de la Heve Light	49	30	43	0	4	2
PARIS Observatory	48	50	13	2	20	30
R. Orne, Oystreham Ch. Light	49	16	37	0	West. 15	34
Pt. de Ver Light	49	20	28	0	31	14
I. St. Marcouf Light	49	29	55	1	8	52
C. Barfleur Light.	49	41	50	1	16	2
C. Levi Light	49	41	50	1	28	28
C. de la Hague	49	43	22	1	57	21
Alderney (Braye Pier Light)	49	43	20	2	12	6
Casquets Lights	49	43	17	2	22	42
Guernsey, Hanois Lt.	49	26	2	2	42	10
St. Peter's, Cas. Cornet Breakwater.	49	27	13	2	31	31
Jersey, St. Helier's, Victoria Pier	49	10	29	2	6	45
Verclut Light	49	13	16	2	0	32
Cape Carteret Light	49	22	27	1	48	31
Chausey Is. Light	48	52	13	1	49	26
Cape Lihou (Granville Light)	48	50	7	1	36	52
Cape Frehel Light	48	41	5	2	19	14
Heaux de Brehat Lt.	48	54	33	3	5	17
Sept Isles Light	48	52	46	3	29	33
Isle de Bas Light.	48	44	45	4	1	44
Isle Vierge Light.	48	38	23	4	34	11
Ushant N.W. Pt. Lt.	48	27	34	5	7	52

WEST COAST OF FRANCE.

Brest Observatory	48	23	14	4	29	12
St. Mathew's Light	48	19	50	4	46	43
Point du Raz	48	2	22	4	44	3
I. de Sein Light	48	2	40	4	52	9
I. de Grois N.W. Light	47	38	55	3	30	46
Belle I., S.W. Pt. Lt.	47	18	43	3	13	43
Nantes	47	13	6	1	32	44
Le Pilier Light	47	2	36	2	21	45
Isle D'Yeu, N. Light.	46	43	5	2	23	0
Sables d'Olonne	46	29	8	1	47	35
Roches Bonnes Lt. Ves.	46	12	0	2	20	51

LATITUDES AND LONGITUDES.

(13) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
WEST COAST OF FRANCE—*cont.*						
I. of Re, N.W. Light	46	14	41	1	33	46
Rochelle Lights	46	9	25	1	9	5
Rochefort	45	56	35	0	57	40
Oleron I. Chassiron Lt.	46	2	51	1	24	42
Cordouan Light	45	35	15	1	10	30
Bordeaux	44	50	14	0	34	30
Cape Feret Light	44	38	43	1	15	30
Bayonne	43	29	30	1	28	26
NORTH AND WEST COAST OF SPAIN.						
Fontarabie Light	43	23	50	1	47	56
St. Sebastian Light	43	19	28	2	0	26
Cape Machichaco Lt.	43	27	20	2	49	26
Bilboa	43	15	48	2	54	0
Santona Light	43	28	36	3	28	2
Santander, C. Mayor Light	43	29	30	3	47	36
Cape Penas Light	43	42	20	5	49	48
Cape Ortegal	43	45	10	7	56	0
Cape Prior	43	33	40	8	19	9
Corunna Light	43	23	20	8	24	8
Sisargas Isles Light	43	21	50	8	50	13
Cape Villano Light	43	9	50	9	12	58
Cape Finisterre	42	52	45	9	15	24
Ons Island Light	42	22	30	8	55	6
Vigo, Cas. La Guia Lt.	42	15	16	8	41	2
COAST OF PORTUGAL.						
Oporto Light	41	9	9	8	37	10
Cape Mondego Light	40	12	0	8	55	12
Burlings Island Light	39	25	0	9	30	17
Cape Roca Light	38	46	6	9	30	0
Lisbon Observatory	38	42	38	9	8	15
Cape Espichel Light	38	24	9	9	13	0
Cape St. Vincent	37	3	0	9	0	0
Cape Santa Maria	36	56	10	7	55	0
SOUTH COAST OF SPAIN.						
R. Guadalquiver Lt.	36	44	0	6	26	46
Cadiz, St. Sebastian Light	36	31	30	6	19	22
Cape Trafalgar Light.	36	10	50	6	1	18
Tarifa Island Light	35	59	53	5	36	38
Gibraltar, —Europa Point Lt.	36	6	30	5	21	0

IX. THE NORTH SIDE OF THE MEDITERRANEAN.

Gibraltar, —Europa Point Lt.	36	6	30	5	21	0
Estapona	36	25	10	5	8	52
Malaga Light	36	42	39	4	25	3
Almeria Mole extr.	36	50	40	2	33	16

(14) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
THE NORTH SIDE OF THE MEDITERRANEAN—*cont.*						
Cape de Gata, —Coralletes Tr. Lt.	36	43	36	2	14	10
Carthagena Light	37	35	45	0	58	26
Escombrera I. Light	37	33	30	0	57	56
Cape Palos Light	37	37	30	0	39	58
Alicante N. Mole Hd.	38	20	18	0	28	43 East.
C. St. Antonio Tower.	38	48	30	0	12	28 West.
Valencia Mole	39	26	51	0	19	4 East.
C. Oropeza Tower	40	4	53	0	9	0
Columbretes Light	39	53	58	0	44	11
Cape Tortosa, —Buda Island Light	40	43	24	0	56	59
Tarragona Mole Lt.	41	7	0	1	16	0
Barcelona Mole Lt.	41	22	10	2	10	55
Cape St. Sebastian	41	53	30	3	12	22
Cape de Creux	42	19	10	3	18	59
Port Vendres	42	31	18	3	6	44
Cette, St. Louis Hd. Lt.	43	23	50	3	42	1
C. Couronne	43	19	33	5	3	6
Marseilles Observatory	43	17	50	5	22	15
Planier Island Light	43	11	57	5	13	44
Toulon Observatory	43	7	30	5	56	0
Hyeres Islands, —Porquerolles, S. Pt.	42	59	0	6	12	19
—Titan, E. Point	43	2	47	6	30	33
Cape Camarat Light	43	12	3	6	40	25
Cannes, Mole Lt.	43	32	50	7	0	47
Cape Garoupe	43	33	51	7	7	56
Nice Ch.	43	42	0	7	17	0
Villa Franca, Pt. Mala Light	43	40	30	7	19	35
C. Delle Mele Light	43	57	17	8	10	21
Genoa, —C. S. Benigno Light	44	24	16	8	54	16
Point Porto Fino	44	18	0	9	13	10
Spezzia, —Tino Island	44	1	34	9	51	0
Pisa, Leaning Tower	43	43	30	10	24	0
Florence	43	46	41	11	15	45
Meloria Shoal Light	43	32	44	10	13	9
Leghorn, I. Light	43	32	37	10	17	41
Gorgona Peak	43	25	30	9	53	30
Vado Rocks Light	43	19	11	10	21	54
Piombino Palace	42	55	45	10	31	45
Capraja, C. Ferrajone	43	2	5	9	50	50
Elba, C. Viti	42	52	30	10	25	0
—Ferrajo P. Stella Ft.	42	48	57	10	20	1
—W. extreme	42	46	10	10	6	30
P. Longone, Focardo Ft.	42	45	14	10	24	33
Pianosa I. high Light.	42	35	6	10	5	45
Africa Rock Light	42	21	28	10	3	49
Monte Christo Island.	42	20	0	10	18	10
Palmajola I. Light	42	51	54	10	28	27
Port Talamone Light.	42	33	4	11	8	0

TABLE XIX.

LATITUDES AND LONGITUDES.

THE NORTH SIDE OF THE MEDITERRANEAN—*cont.*

(15) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
Giglio I. Vaccherecce Hill	42	22	30	10	53	51
Giannutri I., S. Hill	42	14	30	11	6	20
Civita Vecchia Light, S. end of Breakwtr.	42	5	25	11	47	6
R. Tiber, Fiumicino Light	41	46	15	12	13	31
Rome, St. Peters	41	54	5	12	27	10
Cape Anzo, Lt. on the Head	41	26	45	12	37	21
Mt. Circello Light	41	13	21	13	4	9
Gaeta, Orlando Tower	41	12	25	13	34	39
Palmarola N. Pt.	40	56	45	12	51	25
Ponza I., C. Guardia Light	40	53	6	12	57	25
Vandotena, Port Nicolo	40	47	30	13	25	29
Ischia I., Caruso Pt.	40	45	24	13	51	50
—Sn. Angelo Pt.	40	41	25	13	53	20
Procida I., Chiupetto Pt.	40	46	12	14	1	3
C. Misseno Light	40	46	39	14	5	16
Naples, Lt. on Mole Elbow	40	50	15	14	15	32
Mt. Vesuvius, 4100 ft.	40	49	20	14	25	35
Campanella Pt. Light	40	34	8	14	19	32
Capri, Carena Pt. Lt.	40	32	8	14	11	46
Cape Licosa Tower	40	13	50	14	53	0
Cape Suvero Tower	39	2	30	16	9	0
Cape Vaticano	38	37	10	15	52	0
Scylla Castle	38	14	15	15	45	0
Cape dell Armi Light	37	57	20	15	41	0
Cape Spartivento Lt.	37	55	47	16	3	29
Cape Rizzuto	38	57	0	17	1	0
Taranto, —St. Paolo Island	40	26	16	17	10	9
Gallipoli, —St. Andrea Island	40	2	30	17	56	9
C. St. Maria	39	47	40	18	23	0

GULF OF VENICE AND IONIAN ISLANDS.

Cape Otranto Tower	40	6	23	18	30	37
Brindisi Fort	40	39	21	18	0	27
Bari, S. Cataldo Point	41	8	0	16	53	9
Manfredonia, Mole	41	38	0	15	56	0
Pelagosa Island	43	23	44	16	16	3
Pianosa Island	42	12	40	15	45	23
Tremiti Islands, —Caprara I. Light	42	8	30	15	31	54
Ancona, —M. Cappuccini	43	37	38	13	31	8
Rimini Light	44	4	39	12	34	24
Point del Maestra	44	59	0	12	32	9
Chioggia	45	13	45	12	17	24
Port Malamocco, —Fort Alberoni	45	20	50	12	20	30

GULF OF VENICE AND IONIAN ISLANDS—*cont.*

(16) Places.	Lat. N.			Lon. E.		
	°	′	″	°	′	″
Venice, St. Mark's Tower	45	25	53	12	20	31
Grado	45	40	18	13	23	10
Trieste Castle	45	38	37	13	46	27
Pirano, Steeple	45	30	30	13	34	20
Point Salvore Light	45	29	45	13	30	25
Cittanova	45	18	51	13	33	35
Rovigno	45	4	56	13	37	57
Cape Promontore	44	46	0	13	55	10
Fiume Mole Light	45	19	30	14	26	0
Segna Light	44	59	15	14	53	30
Port Kerso entrance	44	57	40	14	23	5
Galiola Rock	44	43	40	14	11	0
Lossini, P. Augusto, Mortar I. Light	44	33	15	14	25	0
Grossa I., Pt. Bianche Light	44	9	40	14	49	30
Zara Light on Pt.	44	7	10	15	13	30
Sebenico Mole	43	44	0	15	53	0
Lucietta Rock	43	37	30	15	34	39
Pomo Rock	43	5	27	15	27	40
S. Andrea	43	1	30	15	45	0
Lissa I., P. S. Giorgio	43	4	0	16	11	30
Spalatro Port, outer Mole	43	30	10	16	26	30
Brazza, S. Pietro	43	23	20	16	33	0
Lesina, P. Gelsa Lt.	43	10	0	16	22	0
Lagosta, P. Rosso Lt.	42	43	20	16	53	29
Curzola, Mole Light	42	57	55	17	7	30
Ragusa Light	42	38	0	18	7	0
Kattaro, Pt. Ostro Lt.	42	23	28	18	32	9
Antivari Fort	42	3	5	19	9	55
C. Pali	41	23	0	19	24	0
Sasseno I. Light	40	29	0	19	14	0
Fano I. Light	39	51	0	19	25	0
Tignoso I. Light	39	48	10	19	57	30
Corfu Citadel Light	39	37	5	19	56	30
Paxo, N. Pt.	39	13	0	20	9	0
Sta. Maura, Mole	38	50	30	20	42	55
Ithaca, P. Vathy, E. Pt.	38	22	20	20	42	30
Cephalonia, Guardiana Rock	38	8	13	20	26	30
Montague Rocks	37	55	0	21	0	10
Zante, Pt. Krionero Lt.	37	48	39	20	54	20
Stamphane I. Light	37	15	12	21	1	12
Messalongia, W. Pt. entrance	38	19	30	21	23	15
Patras Mole	38	14	25	21	46	20
Corinth Acropolis	37	53	25	22	52	45
C. Katakolo Light	37	38	0	21	19	0
Navarino, Gt. Chan.	36	52	0	21	39	0
Sapienza, S. Pt.	36	44	10	21	42	12
Kalamata	37	2	5	22	7	25
C. Matapan	36	23	0	22	29	10
Cerigo, C. Spathi Lt.	36	22	50	22	57	30
Cerigotto S. Point	35	49	15	23	20	0
C. Malea, or St. Angelo	36	26	0	23	12	0

LATITUDES AND LONGITUDES.

COAST OF GREECE, TURKEY AND ASIA MINOR, &c., INCLOSING THE ISLANDS OF THE GRECIAN ARCHIPELAGO.

(17) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
C. Malea or St. Angelo	36	26	0	23	12	0
Monemvasia	36	41	5	23	3	10
Spezzia I. N. E. Pt. Lt.	37	15	37	23	10	0
Nauplia Gulf, P. Kheli, Custom-house	37	19	15	23	9	53
Hydra I., summit	37	19	30	23	28	0
Ægina I., Mole Light	37	44	30	23	25	30
Athens, Parthenon	37	58	5	23	43	40
Peiræus, or P. Drako, Custom-house	37	56	10	23	38	40
C. Themistocles Light	37	55	50	23	37	40
St. Georgio Island	37	28	0	23	56	0
Makro Nisi, S. Pt.	37	38	30	24	6	45
Port Raphti, St. Nicolao	37	53	0	24	1	0
Petali Gulf, Berdouin Island Light	38	11	9	24	5	56
Eubœa I., or Negropont —Euripo, Fort Karababa	38	27	45	23	35	10
—Mt. Delphi	38	37	25	23	50	45
—C. Amoni	39	2	0	10	19	10
—C. Koumi	38	38	45	24	9	42
—C. Doro, Islet	38	9	25	24	36	20
Thermopylæ	38	48	0	22	33	0
Volo Fort	39	24	0	22	56	30
Skiatho, summit	39	10	25	23	29	0
Skopelo, summit	39	8	10	23	42	0
Skantzura	39	5	0	24	7	0
Piperi summit	39	21	0	24	20	0
Psathura	39	29	0	24	10	0
Mt. Pelion, 5310 ft.	39	26	30	23	3	0
Mt. Ossa, 6407 ft.	39	48	0	22	42	0
Mt. Olympus, 9754 ft.	40	4	42	22	22	0
Saloniki	40	38	48	22	57	15
Kassandra Pt.	39	56	42	23	22	0
C. Drepano.	39	56	30	23	57	15
C. Santo or C. Athos	40	6	30	24	21	30
C. Deutheros	40	42	40	24	2	30
Thaso I., Panagia I. off S. Pt.	40	33	0	24	37	45
Lagos B., Fanar Pt. Lt.	40	56	20	25	8	30
C. Hellas, N. ent. to Dardanelles Light	40	2	22	26	10	50
Tenedos, W. Pt. Light	39	50	0	25	58	45
C. Baba Fort	39	28	10	26	4	30
Mt. Ida, 5750 ft.	39	42	0	26	50	30
Eleos I. Light	39	19	10	26	33	0
Merminji Cape Light.	38	37	0	26	46	10
Sanjak Kalassi	38	25	0	27	1	55
Smyrna, Daragaz Pt.	38	26	30	27	9	45
C. Kara Bournou	38	39	55	26	22	45
Spalmatori, or Pasha I. Light	38	30	20	26	18	30
Skala Nuova Light	37	51	30	27	16	35
Boudroum Castle	37	2	0	27	27	30
C. Krio	36	41	0	27	23	30

COAST OF GREECE, &c.—*cont.*

(18) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
Symi Group, S. Islet.	36	30	42	27	54	15
Marmarice, Castle	36	51	5	28	19	0
Marmarice Cape	36	43	55	28	20	45
Karaghatch, watering place	36	51	30	28	30	45
Linosa Island	36	46	30	28	29	0
Makry, theatre	36	38	5	29	9	45
The Seven Capes, W. Pt.	36	23	0	29	10	0

CANDIA OR CRETE.

Pondiko-nisi	35	34	42	23	28	0
Agria Grabusa, N. Pt.	35	38	35	23	34	0
C. Spada, N. extr.	35	41	0	23	43	42
Canea, or Khania Lt.	35	30	10	23	59	45
C. Drepano Light	35	27	20	24	14	55
C. Stavros	35	25	35	24	59	0
Megalo Kastron Lt.	35	20	30	25	9	35
Standia I., summit	35	27	0	25	14	2
Ovo Island	35	36	0	25	35	30
C. Zuan, or St. John	35	20	30	25	47	0
Yanisades Is., N. I.	35	23	0	26	11	30
C. Sidaro	35	19	0	26	19	45
Kupho Nisi, S. Pt.	34	54	42	26	8	42
Gaidaro Nisi, W. Pt.	34	52	20	25	41	20
C. Littinos	34	54	42	24	45	0
Paximadia Is., W. I.	35	0	0	24	35	0
Sphakia	35	12	0	24	8	42
Elaphonisi, Islet off S. W. Pt.	35	15	30	23	30	50
Gavdo, summit	34	49	30	24	4	30
Gavdo Pulo	34	55	10	24	0	30

PRINCIPAL ISLANDS OF THE GRECIAN ARCHIPELAGO.

Santorin, Mt. S. Elias	36	22	0	25	28	45
Anaphi, summit	36	23	0	25	47	0
Stampalia, S. W. sum.	36	32	10	26	19	45
Christiani	36	15	0	25	13	0
Anedro	36	38	0	25	42	0
Amorgo, Mt. Elias	36	50	42	25	55	45
Levitha, E. Pt.	37	0	0	26	32	0
Nio, summit	36	42	42	25	21	0
Sikino, summit	36	40	0	25	6	0
Polykandro, summit	36	37	5	24	55	10
Ananes Rocks	36	33	0	24	9	0
Milo, Mt. Elias, S. W. of I.	36	40	30	24	23	10
Anti Milo, summit	36	48	0	24	15	0
Kimolo, or Argentiera	36	49	20	24	33	30
Polino, summit	36	46	0	24	39	0
Falconera	36	50	55	23	53	45
Karavi Rock	36	46	5	23	36	30
Belo Poulo Island	36	54	55	23	27	45
Siphano, N. Pt.	37	2	42	24	38	30
Serpho, summit	37	10	0	24	30	0
Antiparos, S. Pt.	36	56	0	25	5	0
Paros, middle	37	2	42	25	11	30

LATITUDES AND LONGITUDES.

PRINCIPAL ISLANDS OF THE GRECIAN ARCHIPELAGO—*cont.*

(19) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
Naxos, Mt. Zia, near middle	37	1	50	25	31	15
Denusa, middle	37	6	30	25	50	20
Karo	36	53	0	25	40	0
Skinosa, S. E. Pt.	36	51	0	25	33	0
Heraklia, summit.	36	49	42	25	27	30
Thermia, summit.	37	26	10	24	23	45
Syra, Gaidaro Island.	37	25	30	24	58	50
Rhenea, S. Pt.	37	22	0	25	14	0
Mykoni, sum., E. Pt.	37	27	30	25	27	15
Tinos, summit, E. Pt.	37	35	0	25	14	30
Jura, W. Pt.	37	36	10	24	39	30
Zea, P. S. Nicolo Lt.	37	39	28	24	19	41
Andros, C. Fassa Lt.	37	57	30	24	42	30
Kaloyeri Rocks	38	10	0	25	17	0
Skyro, Mt. Kokhilas	38	49	42	24	37	15
Samothraki, W. Pt.	40	28	10	25	27	0
Imbros, W. Pt.	40	7	10	25	40	0
Lemnos, W. Pt., C. Mourtzephlos	39	58	42	25	2	0
—S. Pt., C. Irene	39	46	35	25	21	30
Strati, Mt. Semal, E. Pt.	39	31	0	25	1	45
Mityleni, P. Sigri Lt.	39	18	0	25	51	15
—Point Fort Lt.	39	6	10	26	34	50
Khios I., P. Kastro Lts.	38	22	40	26	9	15
—S. Point	38	9	0	26	1	30
—Mt. Elias, nr. N. Pt.	38	33	42	26	1	15
Psara, S. Pt., Fort.	38	32	0	25	35	0
Samos, P. Vathi Lt.	37	46	20	26	59	15
—W. extreme	37	44	20	26	35	0
Nikaria, E. Pt., C. Phanari	37	41	45	26	23	0
—W. Pt., C. Papas	37	31	15	25	59	30
Furni Rk., S. of group	37	28	25	26	31	15
Patmos, Port Scala	37	19	30	26	34	0
Lipso, S. W. Pt.	37	18	15	26	44	15
Lero, Mt. Klidi	37	10	42	26	51	30
Kalimno, Mt. near mid.	36	58	50	27	0	0
Kos, N. Pt. Light	36	55	0	27	18	20
—S. or Krokilo Pt.	36	40	50	26	59	50
Nisero, sum., near mid	36	35	30	27	11	0
Kandeliusa, summit	36	29	55	26	59	25
Piscopi or Tilo, Mt. W. end	36	26	5	27	21	0
Sirini or St. John	36	20	50	26	41	10
Karki, S W. Point	36	12	15	27	33	15
Rhodes, Arab's Tower	36	26	36	28	16	14
—Port Lindo, Tower.	36	5	53	28	8	10
—S. Point	35	52	25	27	47	0
Scarpanto, S. Pt.	35	24	0	27	10	0
—P. Tristoma, N. end	35	49	9	26	14	20
Casso or Caxo, Islet off S. W. Pt.	35	21	45	26	51	0
Stakida, middle	35	53	0	26	51	0
Sofrana	36	4	30	26	25	0
Kamila Nisi	35	51	50	26	15	0
Unia Nisia, W. Island.	35	49	30	26	28	30

THE DARDANELLES, SEA OF MARMORA AND THE BOSPHORUS.

(20) Places.	Lat. N.			Lon. E.		
	°	′	″	°	′	″
C. Hellas, N. ent. Lt.	40	2	22	26	10	50
Koum Kaleh, S. ent. Lights	40	0	9	26	12	15
Kilid Bahr, or Cas. of Europe	40	8	45	26	22	54
Chanak Kalehsi, or Castle of Asia	40	8	33	26	24	20
Pt. Galata Light	40	19	30	26	34	41
Gallipoli Light	40	24	18	26	39	24
Fanar Pt. Light	40	24	0	26	44	20
Erekli Light	40	58	28	27	58	15
Constantinople, Serai Pt. Light.	41	0	30	29	0	55
—St. Sophia	41	0	16	28	58	59
Princes Is., Proti L.	40	54	0	29	3	30
Ismid anc. Nicomedia	40	45	30	30	0	0
Boz Burun	40	32	0	28	47	0
Marmora, E. end, Fanar Light	40	37	40	27	45	30
Kutali Road, Light on Rock	40	30	34	27	28	30
Kara Burnu	40	28	0	27	17	0
Skutari, Leander Tower	41	1	2	29	0	45

X. THE BLACK SEA AND SEA OF AZOV.

Roumili Light	41	14	10	29	6	45
Yniada, C. Kouri Lt.	41	52	30	28	4	15
Bourghaz, Minaret	42	30	20	27	30	45
Varna, Evlar Battery.	43	12	0	27	57	16
C. Kaliakra Light	43	21	30	28	30	15
Kustenjeh Light	44	10	20	28	41	20
R. Danube, St. Geo. Mouth Light	44	51	5	29	36	52
—Soulina Light	45	9	20	29	40	30
Fidonisi or Serpent I. Light	45	15	30	30	14	15
Dniestr Mouth, S. Pass	46	4	45	30	29	10
Cape Fontana Light	46	22	49	30	45	28
Odessa, Quarantine Mole	46	29	28	30	44	56
Nikolaev, Observatory	46	58	10	31	58	0
Tendra Point Light	46	19	25	31	30	30
C. Tarkan Light	45	20	52	32	28	20
Sevastopol, C. Khersonese Light	44	35	0	33	21	10
Balaklava Hospital	44	29	50	33	36	25
Kaffa or Theodosia, Church	45	1	34	35	24	26
Cape Takli Light	45	6	30	36	26	10
Kertch, Lt. on the wharf	45	21	18	36	28	28
Genetchesk	46	10	0	34	51	0
Berdiansk	46	38	18	36	47	40

LATITUDES AND LONGITUDES.

THE BLACK SEA AND SEA OF AZOV—*cont.*

(21) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
Taganrog, St. Michael Church	47	12	10	38	57	0
Azov Cathedral	47	7	0	39	26	30
Ghelenjik, N. Bastion	44	33	30	38	3	30
Soukhoum, Castle	42	59	20	41	0	3
Poti Point	42	9	30	41	36	40
Batoum	41	39	26	41	37	21
Trebizonde, Kalmek Point	41	1	0	39	45	48
Vona Bay, Pt.	41	7	45	37	48	0
Sinope, Boztepeh Pt.	42	1	18	35	13	30
Amastra, summit of Point	41	45	20	32	24	45
C. Baba Light	41	18	3	31	25	51
Kili Pt. Light	41	10	0	29	38	15
C. Anatoli, Light	41	13	0	29	9	15

XI. THE EAST AND SOUTH COAST OF THE MEDITERRANEAN.

The Seven Capes, W. Point	36	23	0	29	10	0
Port Sevedo	36	10	20	29	41	0
Khelidonia Pt., S. Id.	36	9	30	30	26	15
Adalia, Light	36	52	0	30	45	30
Alaya, S. E. Point	36	31	30	32	1	0
Cape Anamur, S. Pt. of Asia Minor	36	0	50	32	49	0
Chelindreh	36	9	0	33	22	0
Lissan-el-Kahpeh Lts.	36	14	30	34	1	50
Pt. Karadash	36	32	40	35	21	26
Iskanderun or Alexandretta	36	35	20	36	9	0
Latakiyah Light	35	31	9	35	45	35
Tripoli, Ramkine I. Lt.	34	30	0	35	45	0
Beirut, W. Pt. Light	33	54	10	35	28	0
Saida (Sidon) Jezireh I. Light	33	34	30	35	21	30
Sur (Tyre) Lights	33	16	45	35	11	10
C. Carmel, Monastery Light	32	49	50	34	58	0
Yafa (Joppa) Light	32	2	40	34	45	0
Jerusalem	31	46	30	35	14	45
El Arish, Fort	31	6	30	33	48	0
Port Said, Shore high Light	31	15	35	32	19	20
R. Nile, Damietta mouth Light	31	31	30	31	51	0
—Rosetta mouth Lt.	31	29	30	30	19	0
Alexandria, Light	31	11	43	29	51	40
Arab's Tower	30	59	50	29	34	45
Marsa Matroo, Point Labeit	31	22	55	27	13	26
Port Bardiah	31	44	59	25	6	44
Bombah, Bhurda Id.	32	22	40	23	13	45

THE EAST AND SOUTH COAST OF THE MEDITERRANEAN—*cont.*

(22) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
Dernah, Observatory	32	45	11	22	40	1
Ben Ghazi, Gasar Cas.	32	6	51	20	2	40
Gharah Island	30	47	30	19	56	40
Ras Ben Jawad, ruin.	30	49	0	18	7	0
C. Misratah	32	25	0	15	10	0
Tripoli, Lazaretto Pier	32	54	22	13	11	15
Sphax	34	44	0	10	46	10
Ras Mehediah	35	30	24	11	5	15
Monastir, Burj el Kelb	35	45	24	10	50	42
Cape Bon	37	5	0	11	2	45
C. Carthage	36	52	0	10	21	15
Cani Rocks Light	37	21	0	10	7	30
Galita Island	37	31	15	8	56	30
Sorelle Rocks, Avenger Reef	37	23	45	8	36	0
Bonah, Hospital	36	53	58	7	46	4
Stora Bay, Srigina Lt.	36	56	18	6	53	31
C. Bougaroni, N. Pt.	37	6	18	6	25	0
Bouja, C. Carbon Lt.	36	47	0	5	6	20
C. Bengut	36	57	0	3	55	0
Algier, C. Matifou	36	48	55	3	14	0
—Island de la Marine	36	47	20	3	4	20
—C. Caxine	36	50	0	3	0	0
C. Tenez Light	36	33	0	1	21	0
				West.		
C. Ferrat	35	54	20	0	22	30
Oran, Mers el Kebir Lt.	35	44	21	0	41	2
Zafarin Islands, W. I.	35	11	0	2	25	45
Melilla	35	18	20	2	57	0
Al Khuzemas	35	13	20	3	52	40
Tetuan, Customhouse	35	37	0	5	18	0
Ceuta, Fort Acho	35	53	33	5	17	44
Tangier, Consul's Ho.	35	47	15	5	48	30
C. Spartel	35	47	15	5	55	42

XII. ISLANDS IN THE MEDITERRANEAN.

Alboran Island	35	58	0	3	1	0
THE BALEARIC ISLANDS.						
Formentera, S. E. Pt. Light	38	38	15	1	39	24
				East.		
Iviza, Conejera I. Lt. W. side	39	0	25	1	16	32
—Cala Grosa N. E. Pt. Light	39	5	0	1	36	54
Cabrera, S. Pt. Anciola	39	5	0	2	55	0
Majorca, S. Pt., C. Salinas	39	16	30	3	5	54
—Dragonera Island, off W. end Light	39	35	0	2	21	14
—C. Formento, N.E. Pt.	39	57	45	3	15	0
—C. Pera, E. Point	39	43	0	3	30	0
Minorca, Port Mahon, C. Mola Tower	39	52	45	4	24	30
—C. Dartuch, S.W. Pt.	39	55	0	3	52	0

TABLE XIX.

LATITUDES AND LONGITUDES.

(23) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
ISLAND OF CORSICA.						
Giraglia I., off N. Pt.						
C. Corso	43	1	45	9	24	15
Isola Rossa	42	38	50	8	55	44
Calvi, C. Revellata Lt.	42	35	15	8	43	30
Ajaccio, Cathedral	41	55	0	8	44	45
Sanguinario I. Light	41	52	50	8	35	40
Gulf of Valinco, C. Muro, S.W. Point	41	44	30	8	39	30
C. Pertusato, S. Pt. Lt.	41	22	15	9	11	15
Porto Vecchio, Pt. Chiape Light	41	35	45	9	22	0
Alistro Tower	42	15	15	9	33	0
Bastia, Mole Light	42	41	50	9	27	0
ISLAND OF SARDINIA.						
C. della Testa	41	14	40	9	8	54
Pt. Caprara, Light	41	7	40	8	17	19
C. Caccia, Light	40	34	0	8	10	0
Gulf of Oristano, C. S. Marco	39	51	0	8	26	0
S. Pietro, Lt.	39	9	30	8	15	0
C. Spartivento	38	52	30	8	52	0
Cagliari, St. Pancras Church	39	13	15	9	7	45
C. Carbonara, (Cavoli) Light	39	6	10	9	31	30
C. Bellavista	39	55	50	9	43	30
C. Comino	40	31	30	9	50	30
Tavolara Island, E. Pt.	40	54	50	9	45	0
Cape Ferro, Light	41	9	30	9	32	0
Razzoli, Lt. on N. Pt.	41	18	30	9	20	45
Skerki Bank, Locust Patch	37	45	48	10	48	20
—Hecate Patch	37	45	34	10	49	45
—Keith Reef	37	48	40	10	56	40
—Biddlecombe Patch	37	50	5	10	55	50
Ustica, N. E. Pt.	38	43	20	13	11	15
Lipari or Æolian Ids., —Alicudi, summit	38	32	45	14	21	10
—Filicudi, Church	38	34	6	14	34	15
—Salina, S.E. Mtn.	38	33	15	14	50	45
—Lipari, summit	38	29	0	14	56	0
—Vulcano, S. Pt. Lt.	38	22	6	14	59	0
—Panaria, N. Pt.	38	38	45	15	4	30
—Stromboli, crater	38	47	30	15	13	0
ISLAND OF SICILY, &c.						
Maritimo, Troya Pt. Castle	37	59	30	12	4	30
Favignana, Castle near centre	37	55	45	12	19	15
Levanso, Grosso Pt.	38	1	35	12	21	0
Trapani, Columbara Light	38	0	40	12	30	16
C. St. Vito	38	11	5	12	44	15
C. di Gallo	38	14	20	13	20	0

(24) Places.	Lat. N.			Lon. E.		
	°	′	″	°	′	″
SICILY, &c.—*cont.*						
Palermo, Observatory	38	6	35	13	21	9
C. Orlando	38	8	0	14	45	0
Milazzo, Lt. on N. Pt.	38	16	9	15	13	54
Faro Pt. Light	38	15	50	15	40	0
Messina, Ranieri Tr.	38	11	16	15	35	10
Mount Etna	37	43	0	15	0	0
Catania, Mole Light	37	28	0	15	5	15
Augusta, C. Sa. Croce	37	14	30	15	16	0
Syracuse, S. Maniace Castle	37	3	0	15	18	24
C. Passero, Island off	36	41	15	15	9	45
C. Scalambra	36	47	0	14	30	15
Girgenti	37	16	55	13	32	20
C. Granitola	37	34	0	12	40	0
Marsala	37	47	22	12	27	30
Graham Shoal, volcanic	37	9	0	12	43	0
Pantellaria, summit	36	46	30	12	1	0
—Town, N. Point	36	49	0	11	56	20
Lampedusa, Light	35	29	0	12	35	0
Linosa, summit	35	52	0	12	52	0
Gozo, Guirdan Light	36	4	10	14	13	16
Comino, E. Point	36	30	0	14	21	15
Malta, Spencer's Mon.	35	53	0	14	31	0
—St. Elmo Light	35	54	0	14	31	30
—Marsa Scirocco, Delamara Point	35	49	10	14	34	0
Filfola Island	35	47	0	14	25	0
CYPRUS ISLAND.						
C. Andrea, E. Point	35	42	15	34	36	30
Famagousta	35	7	45	33	57	15
C. Grego	34	56	30	34	6	30
Larnarka	34	55	0	33	38	0
C. Gata	34	33	45	33	2	0
Port Papho	34	44	50	32	23	45
C. Arnauti	35	6	50	32	16	15
C. Kormakiti	35	24	45	32	55	45
C. Plakoti	35	33	30	34	13	0

XIII. THE COAST OF AFRICA, FROM THE ENTRANCE TO THE MEDITERRANEAN, TO THE CAPE OF GOOD HOPE.

				West.		
Cape Spartel	35	47	15	5	55	42
El Araish	35	12	50	6	9	0
C. Dar-al Beida (Casabianca)	33	38	0	7	36	0
North Cape Blanco	33	8	0	8	38	8
Asafi, Mosque	32	18	15	9	12	0
Mogador	31	30	30	9	46	10
Cape Ghir	30	38	0	9	50	0
Cape Noun	28	46	0	11	3	0
Cape Juby	27	58	0	12	52	0
False C. Bojador	26	25	0	14	12	0

TABLE XIX.

LATITUDES AND LONGITUDES.

THE COAST OF AFRICA, &c.—*cont.*

(25) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Cape Bojador	26	7	0	14	29	0
C. Seven Capes	24	41	0	15	0	0
River Ouro, N. Pt.	23	36	0	15	58	0
Cape Blanco	20	46	30	17	4	0
Senegal River, St. Louis Light	16	0	48	16	33	0
Cape Verde	14	43	5	17	34	0
Gorée Island, Dacar Bay	14	39	55	17	24	30
Riv. Gambia, Bathurst	13	28	0	16	35	0
Cape Roxo	12	20	0	16	46	0
Fort Cacheo	12	17	45	16	13	0
Bissao, R. Jeba	11	52	0	15	37	0
Bijouga Islands, W. Breaker	11	30	0	16	58	0
R. Grande, Bijouga, S. Breaker	10	43	0	16	9	0
R. Nunez, Sandy I.	10	37	0	14	42	0
C. Verga	10	12	0	14	28	0
Islands de Los, Crawford Island, centre	9	27	24	13	48	30
—W. Id., Tamara I. W. Point	9	28	0	13	52	0
C. Sierra Leone, Light	8	30	0	13	18	0
Freetown	8	29	55	13	14	30
St. Ann Shoals, N.W. Patches	7	58	0	13	34	0
C. St. Ann, W. Point Sherbro Island	7	34	0	12	58	0
Cape Mount	6	45	0	11	23	0
C. Mesurado Light	6	19	0	10	50	0
Trade Town	5	44	0	9	54	0
Cestos Factory	5	26	24	9	34	42
King William Town	4	49	0	8	43	0
C. Palmas Light	4	22	9	7	44	15
King George Town	4	58	0	6	3	0
Bottomless Pit, Head.	5	15	0	3	57	0
Cape Three Points	4	44	42	2	5	45
Cape Coast Castle Lt.	5	5	25	1	13	45
Accra, Light	5	31	48	0	11	30
				East.		
R. Volta	5	46	0	0	41	10
C. St. Paul	5	50	0	0	58	0
Great Popo	6	16	0	1	54	0
Whydah	6	18	54	2	5	0
Porto Novo	6	23	0	2	35	0
R. Lagos, entrance	6	26	0	3	26	10
R. Benin	5	46	0	5	4	0
R. Forcados	5	22	0	5	19	10
R. Quorra or Niger, E. Point	4	17	0	6	4	0
C. Formoso	4	15	0	6	11	0
New Calabar River	4	28	0	7	1	0
Bonny River	4	23	0	7	8	0
Old Calabar River, Tom Shot Point	4	36	0	8	19	0
C. Cameroons	3	55	0	9	30	0
Fernando Po., P. Clarence Light	3	46	0	8	47	0
—S. Pt. C. Barrow	3	13	0	8	43	0

THE COAST OF AFRICA, &c.—*cont.*

(26) Places.	Lat. N.			Long. E.		
	°	′	″	°	′	″
Princes I., F. Sta. Anna	1	39	30	7	26	30
Brothers Islands	1	21	5	7	17	30
S. Thomas I., Ft. Sebastian Light	0	20	30	6	43	0
	South.					
—Ilha das Rollas	0	0	30	6	30	0
Anno Bon, Turtle I.	1	24	15	5	38	10
—S. extreme, Rk. off.	1	28	35	5	36	7
	North.					
C. St. John	1	9	42	9	22	0
Corisco I.	0	55	54	9	20	0
C. Esteiras	0	38	0	9	21	0
R. Gaboon, S. Pt.	0	22	0	9	23	0
	South.					
Cape Lopez	0	36	0	8	43	0
C. St. Catherine	1	51	0	9	6	0
Mayumba B., Point Matooti	3	22	42	10	38	0
Loango R., entrance	4	39	30	11	45	0
R. Congo, Pt. Padron	6	8	0	12	11	0
St. Paul de Loando	8	48	5	13	13	30
C. St. Bras	10	1	0	13	22	0
Nova Redonda	11	12	0	13	54	0
Benguela, St. Philip Ft.	12	33	54	13	25	54
C. St. Mary	13	25	0	12	33	0
Little Fish Bay, Long Point	15	13	0	12	9	0
Great Fish Bay, Tiger Point	16	30	10	11	46	0
C. Frio	18	23	0	12	2	0
C. Cross	21	50	0	13	57	0
Walvisch B., Pelican Point	22	52	30	14	27	0
Sandwich Harbour	23	30	0	14	25	0
Hollams Bird Island	24	37	24	14	32	0
Spencer B., Mercury Island	25	46	0	15	0	0
Angra Pequena, Pedestal Point	26	38	25	15	8	0
Possession Island	26	58	0	15	13	0
Orange River, bar	28	38	0	16	28	0
C. Voltas	28	44	0	16	32	0
Koussie River	29	40	0	17	10	0
Hondeklip Bay	30	21	0	17	17	30
Olifant R.	31	38	0	18	12	0
C. Donkin	31	54	10	18	19	0
C. Deseada	32	18	0	18	23	0
St. Helena B., Pt. St. Martin	32	40	0	17	59	0
Saldanha B., N. Point Ship Rk.	33	1	42	17	54	0
Dassen Island	33	26	10	18	6	42
Robben I. Light F.	33	49	10	18	23	0
Table Bay, Green Pt. Lights	33	54	10	18	24	30
Devil's Peak	33	57	10	18	26	42
CAPE TOWN OBSERVATORY	33	56	8	18	28	45
Cape of Good Hope	34	21	0	18	29	45
Bellows Rock	34	23	0	18	29	45

LATITUDES AND LONGITUDES.

XIV. NORTH ATLANTIC OCEAN.

ISLANDS, ROCKS, &c.

AZORES OR WESTERN ISLANDS.

(27) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Formigas or Ants, W. Rock	37	16	10	24	47	30
Dollabarat, Shoal	37	13	45	24	44	30
Sta. Maria, Castello or S.E. Pt.	36	55	30	25	1	40
—Villa de Porto	36	56	30	25	9	30
—Matos Point	37	0	50	25	4	50
Sn. Michael, Marqueza or E. Pt.	37	48	15	25	8	20
—Villa Franca Island	37	42	0	25	27	10
—Pta. Delgada, Citadel	37	44	0	25	41	15
—Ferraria or W. Pt.	37	51	40	25	52	10
—Morro Grande Pt.	37	50	40	25	29	40
Terceira, Praya Point	38	44	0	27	3	0
—Angra, Custom ho.	38	38	50	27	13	45
—Serreta, or W. Pt.	38	46	0	27	23	30
Graciosa, Praya Castle	39	3	10	27	58	30
—Gomez, or W. Point	39	4	10	28	4	43
Sn. Jorge, Topo, or E. Point	38	33	0	27	46	45
—Rosales, or N. and W. Point	38	45	5	28	20	15
Pico, Pta. da Ilha or E. Point	38	24	45	28	3	0
—Peak	38	28	0	28	25	0
Fayal, Horta Castle	38	31	40	28	38	30
—West Point	38	35	30	28	50	30
Corvo, N. Point	39	43	30	31	7	10
Flores, Delgada or N. Point	39	31	40	31	13	0

MADEIRA ISLANDS.

Porto Santo, Villa Baleira	33	3	30	16	20	10
Falcon Rock	33	10	50	16	23	30
Baxio Id., S. Point	32	59	40	16	22	50
Bugio I., Agulha Pt.	32	23	0	16	27	0
Dezerta Grande, Sail Rock, N. Point	32	35	0	32	30	0
Madeira, E. Pt. Fora Island Light	32	43	14	16	39	30
—Funchal, Brit. Consulate	32	37	45	16	54	42
—Pargo, or W. Point	32	48	0	17	17	0
—St. Jorge Point	32	49	40	16	54	40
Salvages, Gt. Id. mid.	30	7	30	15	56	0
Great Piton	30	1	0	16	0	10

CANARY ISLANDS.

Alegranza Id. Light	29	23	48	13	29	36
Clara Island	29	18	0	13	32	10
Gracioza Island	29	12	42	13	32	42
Lanzarote, Port Naos	28	57	0	13	32	30

CANARY ISLANDS—*cont.*

(28) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Lanzarote, Pechiguera, or S. Pt. Light	28	50	56	13	52	8
Lobos Id., N. Pt. Lt.	28	45	25	13	49	4
Fuerteventura, Pért Cabras	28	29	0	13	51	42
—Jandia or S.W. Pt.	28	3	0	14	31	26
Gran Canaria, Isleta N.E. Pt. Lt.	28	11	0	15	25	16
—Palmas Mole Light	28	7	6	15	24	51
—S. Point	27	43	40	15	34	0
—Aldea or W. Point	28	1	0	15	49	0
Teneriffe, Anaga N. Point Light	28	35	25	16	8	6
—S. Cruz, Brit. Consulate	28	28	10	16	14	45
—Rasca or S. Point	28	0	0	16	41	10
—Teno or W. Point	28	20	30	16	55	0
—Orotava Port	28	25	10	16	32	0
Gomera, W. Point	28	6	30	17	20	30
—Port Gomera	28	5	0	17	5	55
Palma, S. Cruz, Fort	28	40	30	17	44	30
—S. Point	28	26	42	17	49	42
Hierro or Ferro, Port.	27	46	30	17	54	22
—S. Point	27	37	3	17	59	50

CAPE DE VERDE ISLANDS.

Sal, N. Point	16	51	0	22	55	0
—S. Point	16	34	0	22	56	20
Bonavista, N. Point	16	14	0	22	56	0
—Hartwell Reef	16	11	0	22	41	0
—S. Point	15	57	0	22	49	30
—New Town, Church.	16	7	45	22	55	30
Leton Rocks	15	48	0	23	10	0
Mayo, N. Point	15	19	0	23	12	0
—English Road, Town	15	8	0	23	13	0
—S. Point	15	6	30	23	10	30
St. Jago, Bighude or N. Point	15	19	30	23	46	0
—Porto Praya, Quail Island	14	54	0	23	30	45
—W. Point	15	17	20	23	48	0
Fogo, N. Point	15	1	30	24	21	30
—Luz Town	14	53	0	24	30	30
Brava, W. Point	14	50	0	24	45	10
Romos Rocks, W. end.	14	57	0	24	42	0
St. Nicholas, N. Point.	16	42	0	24	20	30
—E. Point	16	34	30	24	0	0
—S. Point	16	28	30	24	18	0
—W. Point.	16	38	0	24	26	10
Raza, middle	16	38	0	24	36	30
Branco, N. Point	16	41	0	24	41	30
St. Lucia, N. Pt.	16	49	0	24	47	0
St. Vincent, Pto. Grande Bird Island	16	54	45	25	1	10
St. Antonio, N. Point.	17	12	0	25	5	45
—W. Point	17	4	0	25	22	30
—S. Point	16	54	42	25	18	30

LATITUDES AND LONGITUDES.

NORTH ATLANTIC OCEAN, &c.—*cont.*

(29) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Penedo de S. Pedro, or St. Paul's Rocks	0	55	30	29	23	0
Bermuda, Gibb's Hill Light	32	15	4	64	51	36
—Wreck Hill	32	16	20	64	55	0
—Dockyard Clock	32	19	0	64	52	0
—S. extreme of Reefs	32	12	0	64	52	0
—West " "	32	16	0	65	3	0
—North Rock	32	30	0	64	47	0
—E. extreme of Reefs	32	26	0	64	37	0

XV. SOUTH ATLANTIC OCEAN.

ISLANDS, ROCKS, &c.

	Lat. S.			Long. W.		
	°	′	″	°	′	″
Ascension Island, Fort Thornton	7	55	20	14	25	30
St. Helena Observatory Ladder Hill	15	55	0	5	44	0
Fernando Noronha, the Pyramid	3	50	10	32	25	30
The Rocas	3	51	30	33	49	0
Trinidad Island	20	31	0	29	19	0
Martin Vaz Rocks largest	20	28	0	28	51	0
Tristan da Cunha, Settlement N.W.	37	2	45	12	18	30
Inaccessible Islands, W. Island	37	17	0	12	36	0
Nightingale Island	37	27	0	12	29	0
Gough Island	40	19	30	9	44	0
				East.		
Thompson Island	53	56	0	5	30	0
Bouvet Island	54	20	0	5	24	0
Lindsay Island	54	25	0	3	20	0
				West.		
Sandwich Group, N. Traverse Island	56	18	0	27	29	0
—Lieskov	56	41	0	28	10	0
—Candlemas Island, E. Island	57	10	0	26	45	0
—Saunders Island	57	52	0	26	24	0
—Montague Island	58	27	0	26	44	0
—Bristol Island	59	0	0	26	18	0
—Southern Thule, E. Point	59	26	0	27	13	0
South Georgia, C. North	53	57	0	38	13	0
—Wallis Island, W. Point	54	4	0	38	22	0
—South Cape, Rock	54	55	0	36	11	0
Clerke Rocks, S. part	55	1	0	34	48	0
Shag Rocks	53	48	0	43	25	0

SOUTH ATLANTIC OCEAN, &c.—*cont.*

(30) Places.	Lat. S.			Long. W.		
	°	′	″	°	′	″
South Orkney Islands, Laurie I., C. Dundas	60	54	0	44	25	0
—Coronation I., N.W. Point	60	35	0	46	40	0
—Inaccessible Islands	60	40	0	47	38	0
South Shetland Ids., Elephant I., E. sum.	61	6	0	54	45	0
—O'Brien Island	61	32	0	55	52	0
—Bridgeman Island	62	6	0	56	40	0
—King George I., C. Melville	62	2	0	57	30	0
—Livingston Id., C. Shirreff	62	28	0	60	28	0
—Deception Island, P. Foster	62	55	35	60	35	0
—Smith I., Mt. Foster	63	2	0	62	47	0
—C. Possession	63	45	0	61	50	0
—Astrolabe Island	63	16	0	58	20	0
—Joinville Id., S. Pt.	63	39	0	55	48	0
—C. Seymour	64	13	0	56	32	0
—Mt. Haddington	64	12	0	58	2	0
—Biscoe Ids., Pitt Id., middle	65	20	0	65	40	0
—Adelaide Id., mid.	67	15	0	68	15	0
Alexander Id., N. Pt.	68	51	0	73	10	0
St. Peter Id.	68	57	0	90	46	0

FALKLAND ISLANDS.

Jason Id., W. Cay	50	58	30	61	27	45
Grand Jason	51	3	10	61	3	0
White Rock	51	17	0	60	52	0
New Id., N.W. Pt.	51	42	0	61	17	0
Bird Island	52	11	0	60	54	0
W. Falkland, Port Stephens, E. Pt.	52	11	0	60	41	10
—C. Meredith	52	15	10	60	38	0
—Albemarle Rock	52	13	0	60	21	45
—Port Edgar, S. Head	52	0	45	60	13	12
—C. Tamar	51	17	0	59	29	0
—Port Egmont, Old Settlement	51	21	0	60	3	0
—Wreck Id., W. end	51	10	0	60	14	0
E. Falkland, P. S. Carlos, Fanning Head	51	27	10	59	7	15
—Eddystone Rock	51	10	0	59	2	30
—P. Salvador, Shag I.	51	23	45	58	19	0
—C. Carysfort	51	25	10	57	50	30
—Port Louis Flagstaff	51	32	0	58	7	0
—C. Pembroke, Light	51	40	45	57	42	0
—Stanley Har., Storehouse	51	41	0	57	51	30
—Lively I., S.E. Rks.	52	4	45	58	25	0
Sea Lion Id., W. end	52	25	0	59	8	30
George Id., S.W. Pt.	52	22	20	59	47	45
Beauchene Id., S. Pt.	52	55	45	59	12	45

LATITUDES AND LONGITUDES.

XVI. THE COAST OF NORTH AMERICA, &c., From Belle Isle to Cape Florida.

(31) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Belle Isle, S. Pt. Lt.	51	53	0	55	22	15
NEWFOUNDLAND.						
Cape Norman, Light.	51	38	0	55	53	40
Cape Bauld	51	38	50	55	25	0
Bell Island, S. end	50	42	10	55	35	30
C. St. John, Gull Id.	49	59	20	55	21	0
Toulinguet I., W. I. E. side	49	39	30	54	46	10
Offer Wadham Light.	49	35	40	53	45	0
Funk Island	49	45	30	53	10	40
Fogo I., Seldom come by Harbour	49	36	50	54	12	0
C. Freels, Gull Island.	49	15	20	53	25	10
Greenspond Island	49	4	20	53	33	40
C. Bonavista Light	48	42	0	53	5	10
Catalina Har., Green Id., Light	48	30	15	53	2	40
Trinity Harbour, Ch.	48	22	4	53	21	33
Deer Har.. Green Id.	47	53	43	52	42	25
Bull Island	47	46	29	53	46	41
Heart's Content, Ch.	47	52	35	53	22	14
Old Perlican, Church.	48	4	47	53	0	6
Baccalieu I., N. Pt. Lt.	48	8	51	52	47	50
Harbour Grace, Id. Lt.	47	42	45	53	8	11
C. St. Francis	47	48	30	52	48	0
St. John's Har., Chain Rock Battery	47	34	2	52	40	50
—Fort Amherst Light	47	33	54	52	40	18
Cape Spear Light.	47	31	11	52	36	59
Ferryland Head	47	0	58	52	51	6
Cape Race Light	46	39	24	53	4	20
Virgin Rocks (on Gt. Bank)	46	26	20	50	52	30
Cape Pine Light	46	37	4	53	31	45
Cape St. Mary Light.	46	49	30	54	11	34
Placentia Har. ent.	47	15	0	54	0	0
Burin Harbour Light.	47	0	26	55	8	43
St. Pierre Id., Galantry Head Light.	46	46	3	56	9	7
Miquelon Road, anch.	47	6	0	56	21	0
Fortune Bay, Brunet Id. Light	47	15	32	55	51	50
Burges Isls., Large I., S.E. end	47	36	30	57	36	10
Port Basque, Channel Church	47	33	56	59	7	33
Cape Ray, Light	47	37	0	59	18	0
Codroy Roads, Beach Point	47	52	38	59	23	47
St. George Bay, Harbour Point	48	26	35	58	24	50
C. St. George, Red I., near	48	33	50	59	13	10

COAST OF NORTH AMERICA, &c.—*cont.*

(32) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Bay of Islands, Lark Harbour Low Point	49	2	45	58	20	45
Cow Head, N.W. Pt.	49	55	20	57	50	0
Rich Point Light.	50	41	32	57	24	48
S. John Har., N. Pt. of Sesostris B.	50	48	25	57	13	10
St. Margaret Bay, New Ferolle Point	51	1	41	57	4	41
Old Ferolle Harbour Debon Peninsula	51	4	19	56	50	41
Green Island	51	24	10	56	33	45
Belle I. Strait, Chateau Bay, —Castle Id., S. Point.	51	58	0	55	51	0
Amour Point Light	51	27	35	56	50	53
Wood Id., S. Point	51	23	0	57	8	0
Bradore Hills	51	34	0	57	12	0
Exquimaux Ids., Old Fort Id.	51	22	0	57	47	0
Gt. Meccatina Id., S. Point	50	47	0	58	51	30
St. Mary's Rocks, S. Pt.	50	13	0	59	45	0
Cape Whittle	50	11	0	60	8	0
GULF AND RIVER ST. LAWRENCE.						
Natashquan Point, S. side	50	6	0	61	44	0
Mingan Ids., Bowen Rocks	50	14	0	63	1	0
River St. John, ent.	50	17	10	64	21	0
Seven Islands, Carousal Id. Light	50	5	40	66	22	40
Egg Island Light.	49	38	0	67	10	0
Point de Monts, Light	49	19	35	67	21	55
Father Point Light	48	31	25	68	27	18
Bicquette Id. Light	48	25	18	68	53	20
Red Id., centre, Lt.	48	4	20	69	32	56
Quebec, N.E. Bastion	46	49	5	71	13	45
Cape Chatte, Light	49	5	50	66	45	50
C. Magdalen, Light	49	15	40	65	19	30
C. Rozier, Light	48	51	37	64	12	0
Anticosti Id., Heath or E. Point Light	49	5	20	61	42	0
—Bagot Bluff, S. Pt. Light	49	4	0	62	15	0
—S.W. Point Light	49	23	45	63	35	46
—West Point Light	49	52	30	64	32	0
Bonaventure Island	48	29	0	64	10	0
Chaleur Bay, Paspebiac Point Light	48	0	50	65	14	20
—Dalhousie Island	48	4	25	66	22	15
Miscou I., Pt. Birch Light	48	1	0	64	29	25
Miramichi B., Portage I. Light	47	9	50	65	2	40
Escumenac Pt. Light.	47	4	32	64	47	33

LATITUDES AND LONGITUDES.

GULF AND RIVER ST. LAWRENCE—*cont.*

(33) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Richibucto Head Lt.	46	39	40	64	42	30
Cape Tormentine, C. Jourimain Light	46	10	0	63	50	0
Pictou I. Lt., S.E. Pt.	45	49	10	62	30	29
Cape St. George Lt.	45	52	35	61	53	40
Gut of Canso, Light N. ent. W. side	45	41	42	61	28	58
Sea Wolf Id., Light	46	21	30	61	15	33
C. Breton Id., C. North	47	3	0	60	25	0
Pr. Edward I., E. Pt. Light	46	27	9	61	58	15
—C. Bear	46	1	20	62	28	0
—Charlotte Town, Blockhouse Pt. Lt.	46	11	36	63	7	28
—West Point	46	37	0	64	23	0
—North Point Light.	47	3	46	63	59	19
—Richmond Harbour, Bill-hook Light	46	34	44	63	42	29
Magdalen Islands, Gt. Bird Rock Light	47	50	40	61	8	20
—Bryon Island	47	48	0	61	25	10
—East Point	47	37	45	61	24	30
—Amherst I., S.W. C.	47	14	0	62	2	0
—Entry Island	47	17	0	61	42	0
St. Paul Id., N. Light	47	13	50	60	8	20
—S.W. Point Light	47	11	20	60	9	36
Ciboux Rock, Bird I. Light	46	23	10	60	22	30
Scatari I., N.E. Pt. Lt.	46	2	13	59	40	18
Green Id., Light, sum.	45	28	51	60	53	40
Cape Canso, Cranberry Island, Light	45	19	49	60	55	29
Sable Id., W. flagstaff	43	56	24	60	2	47
—E. sand hills	43	58	57	59	45	33

S.E. COAST OF NOVA SCOTIA AND NEW BRUNSWICK.

White Head Id. Light, S.W. Point	45	11	58	61	8	0
Green Island, centre	45	6	15	61	32	30
Liscomb Island, Cranberry Pt. Light	44	59	20	61	57	51
Beaver Id., E. Pt. Lt.	44	49	34	62	20	13
Egg Island, centre	44	39	51	62	51	32
Halifax, Naval Yard Observatory	44	39	38	63	35	10
Sambro Island Light.	44	26	11	63	33	42
St. Margaret B., Peggy Point	44	29	30	63	55	0
Cross Island Light	44	18	43	64	9	57
Port Metway, Light on W. side	44	6	10	64	32	14
Liverpool Bay, Coffin Id. Light	44	1	58	64	37	34
Little Hope Id. Lt.	43	48	31	64	47	15
Rugged Id. Har., Gull Rock Light	43	39	14	65	5	45

S.E. COAST OF NOVA SCOTIA, &c.—*cont.*

(34) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Cape Negro	43	30	15	65	20	45
Cape Sable, Light	43	23	19	65	37	11
Seal Island, Light	43	23	34	66	0	52
Lurcher Shoal.	43	50	5	66	29	40
Bryer Island, Light	44	14	57	66	23	33
Cape Chignecto	45	19	40	64	56	40
St. John, Partridge I. Light	45	14	3	66	3	5
Port St. Andrew Lt.	45	4	10	67	3	0
Grand Manan, Swallow-tail Light	44	45	52	66	44	4
Gannet Rock Light	44	30	38	66	47	0
Machais, Seal Id. Lt.	44	30	7	67	6	13

COAST OF THE UNITED STATES.

West Quoddy Head Lt.	44	48	54	66	56	41
Petit Menan, S. Pt. Lt.	44	22	02	67	51	31
Mount Desert Rk. Lt.	43	58	07	68	07	22
Matinicus Rock Light	43	47	0	68	50	58
Manheigan Island Lt.	43	45	52	69	18	37
Seguin Island Light	43	42	25	69	45	11
Portland, C. Elizabeth Light	43	33	50	70	11	49
Boon Island Light	43	07	16	70	28	16
Cape Ann, Thatchers Island Light	42	38	19	70	34	10
Boston, Cambridge Observatory	42	22	30	71	7	42
Minots Ledge Light	42	16	09	70	45	14
Cape Cod, Light	42	02	21	70	03	18
Sankaty Head Light.	41	16	59	69	57	35
St. George Shoals, 10 ft. spot	41	40	30	67	44	30
Gay Head Light	41	20	52	70	49	47
Block Island Light	41	13	46	71	34	17
Montauk Light	41	04	13	71	51	06
Fire Island Light.	40	37	54	73	12	48
New York, City Hall.	40	42	42	74	0	0
Sandy Hook Light	40	27	39	73	59	49
Delaware Bay, Cape May Light	38	55	50	74	57	16
Philadelphia, State House	39	57	0	75	9	30
C. Henlopen Light	38	46	38	75	04	43
Chesapeake, C. Charles Light	37	07	08	75	53	12
—C. Henry Light.	36	55	29	76	0	12
Washington, Capitol.	38	53	25	77	2	0
Cape Hatteras Light.	35	15	14	75	30	59
Frying Pan Shoals, Light-vessel off	33	35	0	77	50	0
Cape Romain Light	33	01	08	79	22	12
Charleston, Fort Sumter	32	45	08	79	55	13
Savannah, Tybee Id. Light	32	01	20	80	50	31
St. Mary R., Amelia Island Light	30	40	23	81	26	20

TABLE XIX.

LATITUDES AND LONGITUDES.

COAST OF THE UNITED STATES—*cont.*

(35) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
St. John's R., Light	30	23	40	81	24	40
C. Canaveral Light	28	27	0	80	33	0
Jupiter Inlet Light	26	55	26	80	05	05
Cape Florida Light	25	39	56	80	09	24
Carysfort Reef Light.	25	13	15	80	12	45
Florida Reefs, Dry Bank Light	24	37	36	81	06	43
—Sand Key Light	24	27	10	81	52	43
Key West Island Lt.	24	32	58	81	48	07
Dry Tortugas, Loggerhead Cay Light	24	38	05	82	55	46

XVII. THE WEST INDIES, &c.

GULF OF MEXICO.

Cape Sable, Ft. Poinsett	25	5	50	81	8	45
Cape Romano	25	50	45	81	57	0
Egmont Cay Light	27	36	28	82	46	20
Cedar Cays, North Cay	29	8	6	83	5	57
St. George Island, Lt. on Cape	29	36	10	84	58	33
Pensacola Light	30	21	5	87	16	56
Mobile, Sand Id. Lt.	30	11	18	88	1	58
Chandeleur Id. N. Pt. Light	30	3	8	88	51	38
Mississippi Riv. l'outre Light	29	8	36	89	1	30
—South Pass Light	28	59	42	89	7	24
—S.W. Pass Light	28	58	30	89	21	0
Ship I. Shoal, 5ft. patch	28	54	55	91	5	30
Atchafalaya Bay, S.W. Reef Light	29	25	0	91	30	0
Sabine Pass, Texas Pt.	29	42	18	93	50	24
Galveston, Bolivar Pt.	29	22	2	94	45	35
—Cathedral	29	18	17	94	46	39
Cavallo Pass, Light	28	20	49	96	23	30
Aransas Pass, Sn. José S. Point	27	53	30	97	1	20
Rio Grande, entrance.	25	57	22	97	7	36
Tampico Bar	22	15	30	97	46	0
Cape Roxo, I. de Lobos	21	26	0	97	8	0
Vera Cruz, Fort S. Juan	19	11	54	96	8	0
Orizaba Peak	19	2	18	97	13	0
Goazacoalcos Bar.	18	10	0	94	17	0
Carmen Id., N.E. Pt.	18	47	8	91	32	30
Campeché, Fort S. José	19	51	36	90	31	24
Arcas Cays, W. end	20	12	35	91	59	38
Triangles, W. Reef	20	58	0	92	19	30
Cay Nuevo	21	50	0	92	5	0
Arenas Banks, N.W. Cay	22	7	10	91	24	54
Alacran Reef, Perez Cay	22	23	36	89	42	19
Sisal, Fort	21	10	6	90	3	11
Cape Catoché, N.E. Point	21	36	0	87	4	30
Mugeres Island, Tower	21	12	0	86	43	39

BAY OF HONDURAS AND COAST TO TRINIDAD.

(36) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Cozumel Id., N. Point	20	35	30	86	44	48
Chinchorro Bank, N. Cay	18	45	0	87	19	34
Belize, Fort George	17	29	20	88	11	53
Mauger Cay, N.W. end	17	36	15	87	47	3
Half Moon Cay, Light	17	12	12	87	32	48
Icacos Point	16	14	15	88	36	24
Gulf of Dulce, Isabel.	15	24	20	89	10	17
C. Three Points, N.W. end	15	57	45	88	39	24
Omoa, ent. of Har.	15	47	11	88	5	4
Rattan Island, Port Royal, George Cay	16	23	45	86	19	14
Truxillo, Fort	15	55	45	85	59	51
Patook River, E. side.	15	48	50	84	17	44
Swan Ids., W. one	17	24	30	83	57	1
Rosalind Bk, N.W. end	16	54	0	80	52	0
Serranilla Bk., Beacon Cay	15	47	45	79	51	27
Serrana Bk., S. Chan., little Cay	14	21	30	80	15	30
Roncador Cay, S. Pt.	13	34	30	80	5	54
Old Providence, Isabel House	13	22	54	81	22	39
Courtown Cay, middle Cay	12	24	0	81	29	9
St. Andrew's Id., S.W. Cove	12	31	40	81	44	14
Albuquerque, S. Cay	12	10	0	81	50	42
Caxones or Hobbies, W. end	16	6	0	83	19	0
Half Moon Cay, centre	15	8	50	82	42	42
Mosquito Cays, S. end	14	21	12	82	46	30
Cape Gracios á Dios	14	59	0	83	11	0
Greytown or S. Juan de Nicaragua, Arenas Point	10	56	45	83	43	14
Chiriqui Lagoon, C. Valiente Peak	9	10	30	81	55	35
Chagre, Flagstaff	9	19	39	79	59	33
Porto Bello, Ft. St. Jeronymo	9	32	30	79	38	30
Cape Tiburon	8	41	30	77	21	30
I. Fuerte, N. end	9	24	0	76	10	45
Cartagena, Ft. Pastelillo	10	24	57	75	33	18
Savanilla, Nisperal Pt.	11	0	0	75	1	50
Santa Marta, Cathedral	11	15	0	74	12	5
Cape la Vela, Islet	12	10	15	72	12	55
Pt. Gallinas (N. of Bahia Honda)	12	25	0	71	44	25
C. San Roman	12	11	0	70	4	55
Oruba Island, N. Pt.	12	36	0	70	7	55
Curaçoa Island, N. Pt.	12	21	0	69	11	10
Buen Ayre Island, Lt.	12	2	12	68	17	25
Aves Id., W. Group	12	0	0	67	42	25
Port el Roque, Pirate Cay	11	57	0	66	38	55

LATITUDES AND LONGITUDES.

COAST OF COLOMBIA, &c.—*cont.*

(37) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Orchilla Id., W. Pt.	11	49	0	66	11	55
Puerto Cabello, St. Philip's Castle	10	29	30	68	0	25
La Guayra, bastion	10	37	0	66	56	55
Cape Codera, Morro	10	35	0	66	6	15
Barcelona, Hill	10	13	30	64	44	0
I. Tortuga, E. Point	10	55	0	65	12	35
Margarita Id., E. Pt.	10	59	0	64	47	55
Puerto Santo Island	10	43	0	63	10	55
Penas Point	10	43	48	61	50	50
Trinidad, Port Spain.	10	38	40	61	30	36
—Galera Point	10	50	0	60	54	0
—Pt. Icacos, W. Pt.	10	3	47	61	55	43

BAHAMA ISLANDS AND BANKS.

Navidad Bank, centre E. side	20	2	0	68	47	24
Silver Bank, E. end	20	35	0	69	21	24
Mouchoir Bank, N.E. Reef	21	6	30	70	29	54
Grand Turk, Hawk's Nest	21	26	15	71	7	30
Caicos Ids., W. Caicos	21	37	30	72	28	33
Gt. Inagua Id., Lantern Head	20	56	40	73	19	24
Hogsty Reef, N.W. Cay	21	40	30	73	51	3
Mariguana, S.E. Pt.	22	16	30	72	47	3
Samana or Atwood Cay, W. Point	23	5	30	73	49	33
Crooked I., Moss Flagstaff	22	47	30	74	20	24
Watlings Island, Rock S.E. Point	23	56	40	74	28	34
Rum Cay, Harbour Pt.	23	37	45	74	50	8
Long I., South Point.	22	51	0	74	51	54
San Salvador, Hawk's Nest Point	24	9	15	75	33	4
Eleuthera I., Cow and Bull	25	26	15	76	37	8
Nassau, Light	25	5	37	77	22	22
Andros Id., N. Point	25	10	40	78	1	36
Great Stirrup Cay	25	49	45	77	54	46
Great Isaac, N.E. end	26	2	0	79	5	49
Gun Cay, Light	25	34	30	79	18	48
Cay Sal Bank, Light.	23	56	30	80	27	48
Lobos Cay, Light.	22	22	50	77	35	9
Abaco Light	25	51	30	77	21	9
Bahama Id., W. Pt.	26	41	18	79	0	38
Memory Rock	26	56	53	79	6	54
Matanilla, N.W. Shoal	27	21	30	79	3	54

CUBA ISLAND.

Cape Antonio	21	51	30	84	58	4
Havana, Moro Light.	23	9	20	82	22	4
Cardenas, Piedras Cay	23	14	42	81	8	17
Paredon Grande Lt.	22	29	3	78	9	48
Maternillos Pt. Light.	21	40	15	77	8	50

CUBA ISLAND—*cont.*

(38) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Port Nipe	20	47	14	75	33	49
Port Baracoa	20	21	35	74	30	20
Cape Maysi, Light	20	15	10	74	10	23
Santiago de Cuba, Moro Light	19	57	42	75	54	20
Cape de Cruz	19	50	24	77	45	3
Xagua or Jagua, Lt.	22	1	0	80	30	0
Jardines Bank, E. end	21	39	0	81	2	0
Isle of Pines, S. Pt.	21	22	30	82	59	45

JAMAICA ISLAND AND BANKS.

S. Negril Bay, W. end.	18	16	50	78	22	24
Falmouth, Fort	18	30	34	77	40	24
St. Anne's Bay, Long Wharf	18	26	24	77	13	24
Port Antonio, Fort	18	11	15	76	27	24
Morant Point	17	56	0	76	11	44
Port Royal, Fort Charles	17	56	6	76	51	10
Savannah la Mar, Ft.	18	12	20	78	8	54
Navassa Island	18	25	10	75	2	3
Formigas Bank	18	33	0	75	44	24
Morant Cays, N.E. Cay	17	26	30	75	58	20
Pedro Bank, Portland Rock	17	8	0	77	27	0
—N.W. edge	17	36	0	78	52	0
Baxo Nuevo Cay	15	53	0	78	39	4
Grand Cayman, Ft. W. end	19	17	45	81	23	54
Little Cayman, W. Pt.	19	39	10	80	7	54
Cayman Brac, N.E. Pt.	19	44	30	79	43	53

HAITI, OR ST. DOMINGO.

C. Nicola Mole, Fort George	19	49	30	73	22	34
C. Haitien, Town fountain	19	46	40	72	10	42
Isabella Bay, hut	19	53	50	71	4	7
C. Vieux Français.	19	40	0	69	54	0
Samana, Town, Fort.	19	12	30	69	19	50
C. Engano	18	35	51	68	20	40
Saona Island, S.E. Pt.	18	6	42	68	35	22
St. Domingo, Consulate	18	28	12	69	52	0
Caldera, Salinas Point	18	12	0	70	36	0
Beata Island, N.W. Pt.	17	36	45	71	32	54
Alta Vela, summit	17	28	50	71	39	44
Jacmel, Wharf	18	13	30	72	33	39
I. Vache, N.W. Point.	18	6	0	73	43	40
Irois Bay, beach	18	23	48	74	29	34
C. Dame Marie, W. end	18	36	30	74	27	13
Grand Cayemites, S.W. Point	18	36	0	73	48	59
Miragoane, Fort	18	27	0	73	4	38
Port au Prince, Fort Alexander	18	33	10	72	19	56
Gonaive Island, W. Pt.	18	55	26	73	18	34
N. Arcadin.	18	48	0	72	38	4
Gonaives, Verrier Pt.	19	25	42	72	42	52

TABLE XIX.

LATITUDES AND LONGITUDES.

PORTO RICO AND VIRGIN ISLES.

(39) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
Mona Island, W. Pt.	18	5	25	67	57	36
Desecheo Islet, S. Pt.	18	22	42	67	29	10
Jiguero Point	18	21	9	67	17	50
Port San Juan, City	18	29	0	66	7	15
San Juan Point	18	23	0	65	36	0
C. Mala Pasqua	17	59	0	65	49	0
Gallardo Shoals	18	0	0	67	18	0
Guanica Point	17	56	0	66	57	0
Bieques or Crab I., E. Point	18	8	15	65	16	6
Culebra or Passage I., Soldier Point	18	16	46	65	17	7
St. Thomas, Christians' Fort	18	20	27	64	55	40
St. John's, Ram Head	18	18	8	64	41	51
Norman Id., ruin in bight	18	19	17	64	36	27
Tortola Fort Burt.	18	25	4	64	36	35
Ginger Id., S. end.	18	23	18	64	28	0
Virgin Gorda, Vixen Point	18	30	39	64	21	36
Anegada, W. Pt.	18	49	9	64	24	45
—Reefs, E. end	18	36	30	64	10	34
Santa Cruz, Langs Observatory.	17	44	32	64	41	0

WINDWARD, OR CARIBBEAN ISLES.

Sombrero	18	35	45	63	27	46
Anguilla, Custom-ho.	18	13	6	63	4	15
St. Martin, Oyster Hill	18	3	20	63	1	4
St. Bartholomew, Fort Oscar	17	53	58	62	51	6
Saba, Diamond Rock.	17	39	10	63	14	57
St. Eustatius, Fort flag-staff	17	29	10	62	58	50
St. Christopher, Basseterre Ch.	17	18	12	62	42	55
Nevis, Fort Charles	17	7	52	62	37	10
Redondo	16	55	18	62	18	53
Montserrat, Plymouth	16	44	0	62	10	0
Barbuda, Mortella Tower	17	35	50	61	49	36
Antigua, St. John's, Fort James	17	6	40	61	51	21
—English Harbour, Dockyard flag-staff.	17	0	0	61	45	18
Deseada, N. Point.	16	21	4	61	0	0
Mariagalante, S. Pt.	15	52	45	61	15	10
Guadaloupe, C. North	16	31	0	61	26	15
—Basse Terre, Town.	16	0	30	61	46	40
Dominica, N. Point	15	38	0	61	26	0
—Roseau, Ft. Young.	15	17	27	61	23	5
Aves or Bird Island	15	42	0	63	37	46
Martinique, Fort St. Louis	14	36	7	61	4	15
—Caravelle Point.	14	48	30	60	53	0
St. Lucia, P. Castries, battery	14	0	0	61	1	0

WINDWARD ISLES, &c.—*cont.*

(40) Places.	Lat. N.			Long. W.		
	°	′	″	°	′	″
St. Lucia, S. Point.	13	34	0	60	57	0
St. Vincent, Kingston	13	9	4	61	13	15
Bequia Id., Admiralty Bay	13	5	0	61	14	0
Carriacou, Pilot Pt.	12	26	5	61	25	18
Grenada, St. Geo. Ft. George	12	3	2	61	44	55
Barbadoes, Carlisle B. Fort	13	3	0	59	36	45
—East Point	13	7	0	59	25	10
Tobago, N. Point	11	21	0	60	31	0
—Rockly Bay Light	11	10	8	60	42	24

XVIII. GUIANA, North and East COAST of BRAZIL, &c., to CAPE HORN.

	Lat. N.			Long. W.		
R. Orinoco, Mocomoco Point	8	39	25	60	10	15
Demerara, Georgetown Light	6	49	20	58	11	30
R. Berbice, New Amsterdam	6	15	10	57	21	0
R. Coryntyn, Nickerie Fort	5	57	30	56	52	24
R. Surinam, Bram Point	5	56	0	55	4	0
R. Maroni, E. or Française Point	5	42	10	53	56	30
Salut Islands, Royale I. Light	5	17	0	52	32	51
Cayenne, Fort.	4	56	10	52	18	40
R. Oyapok, Mt. Argent	4	22	15	51	37	51
C. Cachipour	3	46	0	51	2	0
Cape North	1	42	0	49	57	0
R. Amazon, Balique I., N. Point	0	59	0	49	56	0
—Macapa Fort	0	0	50	51	2	0
—Mexiana E. Point	0	0	0	49	19	0
	South.					
C. Magoari, N.E. Pt.	0	13	0	48	26	0
Para, Ft. San Pedro	1	28	0	48	30	30
Atalia Point Light	0	35	20	47	22	0
Manoel Luiz Reef.	0	51	25	44	15	0
Maranham, St. Marcos Light	2	29	16	44	16	58
Sta. Anna Light	2	16	22	43	35	15
R. Paranahiba, Amaracao	2	53	20	43	59	50
Barra Acaracu	2	49	30	40	7	54
Ceara Point Macoripe Light	3	42	5	38	27	31
Barra Jaguarybe	4	25	35	37	44	0
Point do Mel	4	58	20	36	51	5
Point Calcanhar	5	9	30	35	28	26
Pititinga	5	23	0	35	19	45

LATITUDES AND LONGITUDES.

EAST COAST OF BRAZIL, &c., TO CAPE HORN—*cont.*

(41) Places.	Lat. S.			Long. W.		
	°	′	″	°	′	″
Cape San Roque	5	29	15	35	15	18
R. Grande do Norte, Natal Cathedral	5	46	41	35	12	9
R. Cunhan, hill	6	20	48	35	1	36
R. Parahyba, Barra Fort	6	57	30	34	49	51
Parahyba, Cathedral	7	6	35	34	52	51
Cape Branco	7	8	15	34	47	1
Itamaraca Id., S.E. Pt.	7	48	55	34	49	56
Olinda, Montenegro Fort Light	8	0	50	34	50	30
Pernambuco, Ft. Picao Light	8	3	31	34	51	43
C. S. Angostinho	8	20	45	34	55	51
Maceio, Light	9	39	35	35	44	36
R. S. Francisco, Light	10	29	0	36	21	30
R. Cotinguiba, Light	10	58	0	37	4	21
Garcia d'Avila, tower	12	33	40	38	1	51
S. Salvador, S. Antonio Fort Light	13	0	47	38	31	35
Morro Sao Paolo, Lt.	13	22	37	38	54	14
Contas, Church	14	17	40	39	0	21
Ilheos, Church.	14	47	40	39	3	1
Rio Belmonte	15	50	45	38	53	1
Porto Seguro Reef	16	23	37	38	58	31
Itacolomi Reef, S. Pt.	16	56	40	39	3	21
Caravellas	17	43	30	39	14	11
Abrolhos Id. Light	17	57	31	38	41	22
Espirito Santo B. Victoria	20	18	50	40	19	51
Cape St. Thomé	22	0	0	40	58	21
Cape Frio	23	0	42	41	59	36
Rio de Janeiro, Raza Light	23	3	40	43	8	21
—Fort Villegagnon	22	54	40	43	9	6
Cape Guaratiba	23	3	40	43	33	1
Sao Sebastiao I., S.E. Point	23	58	30	45	15	21
Alcatrasses Islets	24	6	30	45	40	26
Santos, Moela I. Lt. F.	24	3	6	46	15	34
Iguape	24	42	35	47	32	31
Paranagua, Mel Id. Pt. Light	25	32	40	48	18	20
R. S. Francisco, C. Joao Diaz	26	10	15	48	33	11
Arvoredo Islet	27	17	20	48	22	51
Sta. Catharina, S. Point Light	27	50	27	48	34	53
C. Marta Grande	28	38	0	48	49	41
Rio Grande do Sul, Lt.	32	6	40	52	7	21
Pt. del Palmar	34	4	10	53	31	51
C. Castillo	34	21	19	53	46	53
C. Santa Maria	34	40	1	54	8	51
Lobos Island	35	1	39	54	52	53
Maldonado, E. Pt. Lt.	34	58	15	54	56	47
Flores Island, Light	34	56	55	55	54	41
Monte Video, Custom-house	34	54	15	56	12	19

EAST COAST OF BRAZIL, &c., TO CAPE HORN—*cont.*

(42) Places.	Lat. S.			Long. W.		
	°	′	″	°	′	″
Monte Video, Cerro Light	34	53	3	56	15	13
Colonia, Light	34	28	10	57	51	40
Buenos Ayres, landing place	34	35	30	58	22	0
Pt. Indio	35	16	0	57	17	30
C. S. Antonio, N. Pt. Pt. Rasa	36	19	0	56	45	0
C. Corrientes	38	5	0	57	29	0
Bahia Blanca, Mount Hermoso	38	59	0	61	40	0
Rio Negro, Main Pt.	41	2	0	62	45	0
Valdez Peninsula, Pt. Delgada	42	46	0	63	37	0
Port St. Elena, S. head	44	32	0	65	22	0
The Oven, or Pr. Regent Haven	45	0	0	65	40	0
Cape Blanco	47	12	0	65	44	0
Port Desire	47	45	0	65	55	30
C. Watchman	48	21	0	66	20	0
Port S. Julian, Sholl Pt.	49	15	18	67	41	12
Port Sta. Cruz, Mt. S. side	50	9	0	68	22	0
Port Gallegos, C. Fair-weather	51	32	5	68	55	30
Cape Virgins	52	20	10	68	21	42
Dungeness Point	52	24	0	68	25	42
Catherine Point	52	32	0	68	44	0
Magellan Str. Direction Hill.	52	22	25	69	29	0
—Sandy Point	53	10	0	70	53	30
—Port Famine	53	38	18	70	56	0
—C. Froward	53	53	45	71	18	30
—Tuesday B., Cascade Point	52	49	54	74	28	30
—Port Tamar	52	55	30	73	44	30
C. S. Sebastian.	53	19	0	68	10	0
C. San Diego, E. Pt.	54	41	0	65	7	0
Staten Id., C. St. John, E. Point	54	42	48	63	43	30
C. Good Success	54	55	0	65	22	0
Cape Horn	55	59	0	67	16	0
False Cape Horn	55	43	0	68	6	0
Diego Ramirez Is.	56	25	0	68	44	0

THE TIMES OF HIGH WATER.

On the Full and Change of the Moon, at the principal Ports, and along the Coasts, particularly of Great Britain and Ireland, with the vertical rise of the Tide in Feet at the Spring Tides.

Places.	Situation.	Times. h.	Times. m.	Rise. Feet.
A.				
Abaco	Bahamas	8	0	3
Abd-ul-Kuri	Indian Ocean	4	30	8
Aberdeen	Scotland	1	0	12
Aberdovy	Wales	8	0	15
Abrolhos	Brazil	4	48	6
Acapulco	Mexico, W.C.	3	6	1½
Acheen Head	Sumatra	8	45	8
Achillbeg	Ireland	5	14	10¾
Adelaide Port	Australia, SC.	5	44	6
Aden	Arabia, SEC.	9	45	7
Adenara	Flores, Malay Archipelago			8
Agnes (St.)	Scilly Islands	4	30	16
Agoada Point	Hindostan, W. Coast.	10	30	9
Aix, Ile d'	France	3	20	17
Akaroa Harbour	New Zealand	3	24	8
Akyab	Bay of Bengal	9	45	9
Albemarle, Port	Falkland Ids	7	15	7
Aldborough	England	10	45	8
Alderney Island	Eng. Channel	6	46	17
Algoa Bay	Africa, S. Co.	4	0	4–5
Altona	Germany	5	19	7
Amboyna	Moluccas	0	33	7
Ameland Island	Netherland	11	30	7
Amiranté Island	Indian Ocean	5	0	8½
Amlwch	Wales	10	30	18
Amoy, (Inner Hrb.)	China, E. Co.	12	0	16
Amsterdam	Indian Ocean	11	0	3
Andaman Island, Port Cornwallis.	Indian Ocean	10	0	8¾
Andrava Bay	Madagascar.	3	30	7
Angra	Azores	12	32	4½
Angra Pequena	Africa, SWC.	2	30	8
Annapolis	Nova Scotia.	11	0	30
Annapolis	United States	4	38	1
Anticosti Island, West Point	Gulf of St. Lawrence.	2	0	6
Antongil Bay	Madagascar.	4	0	5
Antonio, Cape St.	Cuba	9	30	1½
Antonio, Port St.	Patagonia	10	40	28
Antwerp	Belgium	4	25	15
Aor Pulo	Sumatra NEC			5
Apalachicola Bay	Gulf Mexico			4
Arbroath	Scotland	1	35	14
Arcachon	France	4	37	11¾
Arcas Rocks	Gulf Mexico	Noon.		1½
Ardglass	Ireland	11	0	16
Ardrossan	Scotland	11	45	10
Arica Road	Peru	8	0	5
Arkhangel	White Sea	7	28	2½
Arklow	Ireland	8	45	4
Arnhem Bay	Australia	8	0	6–8
Arthur, Port	Tasmania	7	52	4
Arundel Bar	England	11	35	
Asaph (St.) Bay	Australia	5	45	4
Ascension Island	Sou. Atlantic	5	30	2
Auckland Harbour	NwZeal N.Is.	7	5	11
Augustine (St.) Bar	United States	8	32	5
Augustine (St.) Bay	Madagascar.	4	30	13
Avatcha Bay	Kamschatka	3	30	6½
Ayr	Scotland	11	50	8¾
B.				
Bab-el-Mandeb	Persian Gulf	12	30	
Bahia	Brazil	3	30	8
Balade Harbour	N. Caledonia	6	30	
Balambangan Isld.	Borneo	10	0	7
Balasore River	Bay of Bengal	10	0	15
Balbriggan	Ireland	10	40	11
Ballinskellig Bay	Ireland	3	40	12
Ballycastle Bay	Ireland	6	8	4
Ballyshannon Bar.	Ireland	5	18	11½
Balta	Scotland	9	45	6
Baltimore	Ireland	4	23	10½
Banana Island	Africa, W. Co.	8	15	9
Bancoot River	Hndstn. WCo	2	0	12
Banda	Moluccas	4	0	6
Banff	Scotland	0	28	10½
Bantam	Java			5
Bantry Harbour	Ireland	3	47	10
Barbara, Port	Patagonia, W. Coast.	12	28	6
Barbe (St.)	SumatraNEC	6	0	6
Bardsey, Island	Wales	7	40	15
Barfleur	France	8	51	17
Barmouth	Wales	7	41	17
Barnstable	United States	11	0	9
Barnstaple Bar	England	5	30	19
Barren Islands	Madagascar.	4	45	12
Bas, Ile de	France	4	49	23
Bassein River	Bay of Bengal	10	0	9
Batanes, Basheelds.	China, E. Co.			4
Batchian, Gilolo	Moluccas	1	0	6
Bate (Gulf of Cutch)	Hindostan	12	20	12
Bathurst	Gulf St. Law.	3	15	7
Baticolo River	Ceylon	5	0	2–3
Bay of Islands	New Zealand	7	15	9
Bayonne (Bar)	France	3	45	12
Beachy Head	England	11	20	20
Bear Cape	P. Edward's I	9	0	6
Beaufort	United States	7	26	3¼
Beaumaris	Wales	10	32	21½
Beaver Harbour	AmrcaNWCo	1	15	15½
Belfast	Ireland	10	43	9½
Bell Sound	Spitzbergen	8	56	3¼
Bembatooka Bay	Madagascar.	4	30	16
Bembridge Point	England	11	0	14
Bencoolen	Sumatra	6	0	3–5

TABLE XX.

TIMES OF HIGH WATER.

Places.	Situation.	Times. h.	Times. m.	Rise. Feet.
Benin River	Africa, S. Co.	4	30	7
Berbice	Guayana ...	4	30	11
Bergen	Norway	1	30	4
Bermudas, Ireland Island	North Atlan.	7	14	4
Berwick	Scotland ...	2	18	15
Bic Island	Gulf St. Law.	2	15	14
Bilbao Bar	Spain	3	0	13
Blakeney Bar	England.....	6	30	15
Blanco (Cape).....	Africa, W. Co.	11	46	6
Blewfields	Mosquito Co.	1	50	2
Block Island	United States	7	36	3½
Blyth	England.....	3	15	15
Bodega	California ...	11	17	4¾
Bojador (Cape) ...	Africa	12	0	8
Bolt Head	England.....	5	45	15
Bombay (Dk. Yd.)	Hindostan ...	11	40	12-17
Bonacca Island ...	Bay of Hond.	9	0	1½
Bonny R. C.	Africa, W....	5	0	9
Bordeaux	France	6	50	14
Borkum Road ...	Germany ...	10	30	8-10
Boston Sluice	England.....	7	0	12
Boston, Charleston Yard	United States	11	27	11½
Boston Light	United States	11	12	11
Botany Bay.....	Austral., E. C.	8	15	7-8
Boulogne.....	France	11	25	25
Bow Island.....	South Pacific	2	40	3
Bowen Port	Australia ...	9	35	16
Boyanna Bay	Madag., W.C.	4	30	15
Bravo	Africa, E. Co.	4	30	8
Bray Head	Ireland	10	45	12
Bréhat.....	France	5	51	31
Brest	France	3	47	19
Bridgewater Bar...	England.....	6	50	35
Bridlington	England.....	4	39	16
Bridport	England.....	6	5	11¼
Brielle	Netherlands.	3	0	5
Brighton	England.....	11	15	19¾
Bristol (King Rd.)	England.....	6	56	44
British Sound	Madag, E. C.	4	0	9½
Broad Sound	Austral., E.C.	11	0	20-30
Broadhaven Har...	Ireland	5	0	10½
Broken Bay.....	Austral., E.C.	8	0	6-9
Brouwershaven ...	Netherlands.	2	15	10
Bruni River.....	China, E. Co.	11	0	12
Buenos Ayres	Sou. America	Noon		Irreg
Bulama Island, Arcas Channel..	Africa, W. C.	10	10	14
Bulsaur River	Hindost., WC	1	45	18
Buncranna	Ireland	5	40	16
Burntisland.....	Firth of Forth	2	24	16¼
Bushire River	Persian Gulf.	7	40	5½
Bussorah Riv. Bar	Persian Gulf.	12	0	
Button Islands ...	Hudson Strait	6	50	
Byron Cape.....	Austral., E. C.	9	45	6
C.				
Cadiz	Spain	1	45	9½
Caen	France	10	57	
Caermarthen Bar..	Wales	6	10	26
Caernarvon	Wales	9	33	13¾
Cajeli Bay	Bouro	1	0	6
Calais	France	11	49	19½
Calcutta	Bengal	2	30	
Caldy Island	Bristol Chan.	6	0	24
Calebar Rio.....	Africa, W.Co.	5	0	9
Caledonia Harbour	New Granada	11	40	1½
Calf Sound	Isle of Man .	11	17	16¼
Callao Bay	Peru	5	47	4
Camaguin	Babuyan Is..	6	0	6
Cambing	Banda Sea...	Noon		6
Cameroon Rio	Africa, W.Co.	4	0	6
Campbell, (Cape)..	New Zealand	6	0	8
Campbell Island ...	South Pacific	12	0	43
Campbell Town ..	Gulf St. Law.	4	0	10
Campbellton	Scotland ...	11	45	8½
Campobello	Bay of Fundy	11	19	21
Cancale Bay	France	6	20	37
Canso Gut	Nova Scotia .	9.	10	4½
Canso Harbour ...	C. Breton Is.	7	48	6½
Canton, (City).....	China.....	2	40	
Cape Coast Castle.	Africa, W.Co.	4	30	6
Capricorn Group...	Austl., E. Co.	8	0	7
Cardiff.....	Wales	6	59	38
Cardigan	Wales	7	1	12
Cardagos Garayos Shoals	Indian Ocean	2	0	4
Carlingford Bar ...	Ireland	10	40	17
Carlisle, (Port) ...	England.....	12	10	20
Carlos, (St.) Port..	Patag., W.Co.	11	15	6
Cartagena	New Granada	11	0	1½
Carteret, (Port) ...	France	6	25	31
Casquets	Eng. Channel	6	45	15
Castlereagh, (Cape)	Tierra del Fuego ...	2	50	4
Catharina, (St.) Pt.	Brazil.....	2	30	3
Catoche, (Cape) ...	Yucatan ..	9	30	1
Cayenne	Guayana ...	3	45	6
Cayeux	France	11	5	27½
Ceuta	Africa, N. Co	2	6	3¾
Champion Bay ...	Austl., W.Co.	9	10	1
Charles, (Cape) ...	United States	7	45	5
Charleston	United States	7	18	6½
Charlotte Town ...	Prince Ed. Is.	10	45	9½
Chatham	England.....	1	2	17½
Chatte, (Cape) ...	United States	12	0	13
Chausey Islands ..	France	6	9	35
Cheduba	Bay of Bengal	11	30	8
Chepstow	England.....	7	30	38
Cherbourg	France	7	49	17
Chester	England.....	10	30	26
Chichester	England.....	11	30	
Chignecto, (Cape) .	Bay of Fundy	11	0	32
Chimmo Bay	China, E. Co.	10	20	16
Chinchew Harbour	China, E. Co.	12	25	17
Chinhae, (Yung R.)	China, E. Co.	11	20	12½
Chittagong Bar ...	Bay of Bengal	1	15	15
Chosan Harbour...	Japan Sea ...	7	45	7
Christchurch	England.....	9	0	5
Christmas Island...	Indian Ocean	10	0	
Christmas Harbour	Kerguelen Is.	2	0	2
Chusan, Ting Hae.	China, E. Co.	11	0	12

TABLE XX.

TIMES OF HIGH WATER.

Places.	Situation.	Times. h.	Times. m.	Rise. Feet.
Portsmouth	United States	11	23	10
Post Office Island	Galapagos ...	2	10	6
Pouinipet Island...	Caroline Isld.	6	0	4½
Princes Island ...	Bight of Biafra	3	45	4½
Puget Sound	Amer. N W Co	6	0	18
Pulicat Shoals	Coromandel Coast	9	25	2¾
Pulo Condore	China Sea ...	3	0	4
Q.				
Quebec.....	Canada	6	38	18
Queda	Malacca Strt.	12	0	5½
Queen Charlotte Sound	New Zealand	8	50	8
Quentin, Port San	California ...	9	5	9
Queenstown.....	Ireland	5	1	11¾
Quilca River	Peru	8	0	6
Quilimane Riv. Ent	Africa, E. Co.	4	15	16
Quiloa Harb.	Africa, E. Co.	4	45	12
R.				
Rachada (Cape) ...	Malacca Strt.	5	30	13
Radama (Port) ...	Madagascar, W. Coast..	4	40	13
Ragged Island.....	Java Sea ...	8	10	3
Ragged Point	Borneo, E Co.			7
Raine Island	Torres Strait	8	10	10
Rajahpoor Harbour	Hindos. W Co.	11	0	12
Ramsey	Isle of Man..	11	12	19¼
Ramsgate.....	England.....	11	44	15
Rangoon	Bay of Bengal	5	30	21
Ras-el-Khyma	Persian Gulf.	11	0	7
Realejo.....	Cen. America	3	6	11
Rendesvous Island.	Borneo, S.W. Coast			8
Resolution Bay ...	Marquesas...	2	30	4
Rio Janeiro	Brazil.....	3	0	4
Rocas	Sou. Atlantic	5	15	10
Rochefort	France	4	6	17
Rochelle	France	3	31	17
Rodrigue Island ...	Indian Ocean	1	45	6
Roque, (Cape S.)..	Brazils			10
Rotterdam	Netherlands.	3	45	7
Rouen	France	2	28	
Royal Har., Rustan	Bay of Hond.	7	45	3½
Rush (Port).....	Ireland	6	8	5½
Rye Bay	England.....	11	20	22
S.				
Sable (Cape)	Bay of Fundy	8	30	9
Sable Isld., N. Side	Nova Scotia.	7	30	4
Sable Isld., S. Side	Nova Scotia.	6	30	4
Saintes	Caribbn Sea	6	45	
Salcombe	England.....	5	41	15
Saldanha Bay	Africa, W.Co.	2	0	6
Salem	United States	11	13	0½
Saltees	St. George's Channel...	5	40	
Salvador, San(Port)	Falkland Ids.	8	10	8
San Blas	Mexico W Co.	9	41	6½
San Lucar	Spain	1	53	12½
Sandalwood Bay...	Fijii Islands	6	0	6?
Sandy Hook	United States	7	29	5½
Sandy Island	Madagascar, W. Coast	5	0	15
Sanguir Island.....	Moluccas ...			6
Santa Cruz River..	Patago. E.Co.	9	30	40
Santa Maria Island	Chile	10	20	6
Santandar	Spain	3	30	15
Saparooa Island ...	Moluccas ...			6
Saugor Island	Bay of Bengal			12
Savannah, Entr. ...	United States	7	20	8
Scalloway	Shetland ...	9	30	5¾
Scarborough	England.....	4	11	15¾
Scarcies Rivers ...	Africa, W.Co.	7	10	10
Scilly (St. Agnes)	England.....	4	30	16
Sea Bear Bay	Patago. E.Co.	12	45	20
Seal Isld., C. Sable	Bay of Fundy	9	0	12
Sebastian, San.....	Brazil	2	0	4
Sein, Ile de	France	3	21	17½
Selsea Bill	England.....	11	45	16½
Senegal	Africa, W.Co.	10	30	
Serrana Bank	Mosquito Co			2
Setubal	Portugal.....	2	30	8
Seven Islands	Lapland.....	8	20	12
Seven Islands Bay	Gulf St. Law.	1	40	9
Sheerness.....	England.....	0	37	16
Sheet Harbour ...	Nova Scotia.	8	6	6½
Shelburne	Nova Scotia.	8	30	8
Sherbro River.....	Africa, W.Co.	6	0	11
Shields, North.....	England.....	3	23	13½
Ship Harbour	Nova Scotia..	7	54	6½
Shoal Water Bay..	Austral. ECo	10	30	12-18
Shoreham	England.....	11	34	18
Sierra Leone	Africa, W.Co.	7	55	8
Simon's Bay	Africa	2	44	5½
Simon's, St., Isld..	United States	7	43	8½
Singapore.....	Malacca St...	9	45	10
Sisal.....	Gulf Mexico			2
Sitka	Amer. N W Co	0	34	
Skerries	Ireland, N Co.	6	15	5
Sligo Bay.....	Ireland	5	18	11½
Slyne Head	Ireland W Co.	4	30	13½
Smerwick	Ireland	3	50	11½
Sofala River.....	Africa, E. Co.	4	0	19
Southampton	England...	10	30	13
		12	45	
Southwold	England.....	10	20	6½
Spain, (Port)	Trinadad ...	4	30	4
Spurn, Point	England.....	5	26	18¾
Staten Island	Trr. del Fuego	4	30	8
Stephen (Port) ..	Austral. ECo.	9	0	6
Stephen (Port) ...	Falkland Ils.	7	45	7½
Stirrup Cay	Bahamas ...	7	0	4
Stockton (Tees) ...	England.....	4	40	11
Stonehaven	Scotland ..	1	10	14
Stornoway	Scotland ...	6	46	13
Strangford Bar ...	Ireland	10	53	14
Strangford Quay ...	Ireland	12	31	10½
Stromness	Orkneys ...	9	0	10
Suez Bay	Red Sea.....	2	0	6
Sunderland	England.....	3	22	14½

TABLE XX.

TIMES OF HIGH WATER.

Places.	Situation.	Times. h.	Times. m.	Rise. Feet.
Supé Bay	Peru	4	50	3
Surat	Hindos. WCo	4	0	19
Surinam	Guayana	6	0	9
Swan River	Austra. WCo.	9	0	14
Swansea	Wales	6	1	27½
Sydney	Austral. ECo.	8	38	4¾
Sydney Harbour	Cape Breton.	9	0	5
T.				
Table Bay	Africa, W.Co.	2	40	5
Taichow Island	China, E.Co.	9	0	14
Talcahuano	Chile	10	14	5
Tamar Port	Magellan Str.	3	5	5
Tamareed	Indian Ocean	7	20	8
Tamatave	Madagascar.	4	18	8
Tangtang Harbour	Madagascar.	4	30	6
Tanna	New Hebrds.	5	35	3
Tappanooly Harb.	Sumatra	6	10	6
Tarbert	Ireland	4	57	14½
Tarifa	Spain	1	46	6
Tarpaulin Cove	United States	8	4	2¾
Tavoy River	Bay of Bengal	10	30	20
Tay River (Bar)	Scotland	2	6	16
Tees River (Bar)	England	3	45	15
Teignmouth	England	6	0	13
Teneriffe	C. Verde Ils.			8½
Terceira	Azores	12	32	4½
Terschelling, West.	Netherlands.	8	40	6
Texel	Netherlands.	6	30	4
Thirsty Sound	Austral. ECo.	10	45	12-18
Thomas, (St.) Isld.	Africa	3	25	4½
Three Points (Cape)	Africa, W.Co	4	0	4
Tien-pak Harbour.	China, E.Co.	12	0	8½
Tinghae, Chusan	China, E.Co.	11	0	12
Tobago	Caribbn. Sea	Irreg.		3½
Tongatabu	South Pacific	6	50	4
Torbay	England	6	0	13½
Townshend Harb.	Trr. del Fuego	2	30	5
Townshend Port	Oregon	3	49	5½
Treguier	France	5	32	25
Triangles	Gulf Mexico			1½
Trincomalee	Ceylon, S.Co.	8	18	2
Tristan d'Acunha	Sou. Atlantic			8
Tynemouth (Bar)	England	3	20	14¾
Typa Anchorage	China, E.Co.	10	0	7
U.				
Union Bay	La Plata	3	10	12
Upstart (Cape)	Austral. ECo.	11	0	6-8
Ushant	France	3	32	19¼
V.				
Valdivia, (Port)	Chile	10	35	5
Valentia Harbour.	Ireland	3	42	11
Valery, St. en Caux	France	10	46	27
Valery, (St.) sur Somme	France	11	46	27
Valparaiso	Chile	9	32	5
Vera Cruz	Gulf Mexico			2
Verde (Cape)	Africa, W.Co.	7	45	5
Versavah	Hindos. WCo	12	15	16
Vincent, (Port St.)	N. Caledonia	5	50	4½
Virgin (Cape)	Magellan Str.	8	30	36-42
Volcano Islands	China, E. Co.	11	30	15
W.				
Wahaay Harbour.	Moluccas, N. Coast	6	0	3
Walvisch Bay	Africa, W.Co.	1	54	6
Wangarva Harbour	New Zealand	8	15	7
Warren Point, Carlingford	Ireland	11	10	14½
Waterford Bridge.	Ireland	6	6	13½
Wellesley Island	Austral. NCo.	7	30	8-12
Weser (outer Light Vessel)	Germany	11	30	
Western (Port)	Austral. S.Co.	1	10	8
Westness	Orkneys	9	11	10
Westport	Ireland	4	57	12¾
Wexford	Ireland	7	21	5
Whampoa Docks. (China)	In March	1	40	7-8
	In April.	1	15	
	In May. & June.	0	30	
Whitby	England	3	45	15
Whitehaven	England	11	14	23¼
Wick	Scotland	11	22	10
Wicklow	Ireland	10	29	9
Wilmington	United States	9	6	3
Wilson Promontory	Austral. S.Co.	2	0	10
Winterton Ridge	England	7	50	
Wisbeach	England	7	30	15
Woodbridge Haven, (Bar)	England	11	45	12
Woolwich	England	1	37	18½
Wranger Oog	Germany	12	0	9?
Wrath, (Cape)	Scotland	7	30	15½
Wusung Riv. Entr.	China, E. Co.	1	30	12
Y.				
Yang-tse-KiangEnt	China, E. Co.	12	0	15
Yarmouth Road	England	9	15	6
Yarmouth	Isle of Wight	10 0 AM / 12 0 PM		7
Yellaboi	Africa, W.Co.	7	10	10
Ylo Road	Peru	8	15	6
York Factory	Hudson Bay.	11	15	10-14
Youghal	Ireland	5	14	12¾
Z.				
Zanzibar	Africa, E.Co.	4	20	10

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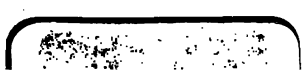
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